

Air Quality Progress Report 2011

May 2011



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

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Executive Summary

Down District Council comprises a largely rural area of around 65,000 hectares in the south east of Northern Ireland, with a population of some 68,000. The main centres of population are located in Downpatrick, Newcastle and Ballynahinch. Agriculture and tourism form by far the most significant economic base in the area, with relatively little heavy industry.

With respect to Nitrogen Dioxide, the 2010 Progress Report has identified two exceedences of the Nitrogen Dioxide annual mean objective at diffusion tube monitoring sites in Downpatrick i.e. Market Street and Church Street. A Detailed Assessment for NO₂ was submitted by Down District Council in 2010. As a result of this a real time analyser has now replaced the diffusion tubes at the junction of Market Street/ Irish Street, Downpatrick. Realtime data has now been available for six months and the results are below the objective. Further monitoring is to continue at this site.

There have been no other exceedences of the Air Quality Strategy objectives within Down District Council area.

Table of contents

| | | |
|----------|--|-----------|
| 1 | Introduction | 6 |
| 1.1 | Description of Local Authority Area | 6 |
| 1.2 | Purpose of Progress Report | 7 |
| 1.3 | Air Quality Objectives | 8 |
| 1.4 | Summary of Previous Review and Assessments | 9 |
| 2 | New Monitoring Data | 11 |
| 2.1 | Summary of Monitoring Undertaken | 11 |
| 2.2 | Comparison of Monitoring Results with Air Quality Objectives | 17 |
| 3 | New Local Developments | 22 |
| 3.1 | Road Traffic Sources | 22 |
| 3.2 | Other Transport Sources | 22 |
| 3.3 | Industrial Sources | 22 |
| 3.4 | Commercial and Domestic Sources | 22 |
| 3.5 | New Developments with Fugitive or Uncontrolled Sources | 22 |
| 4 | Planning Applications | 23 |
| 5 | Conclusions and Proposed Actions | 24 |
| 5.1 | Conclusions from New Monitoring Data | 24 |
| 5.2 | Conclusions relating to New Local Developments | 24 |
| 5.3 | Proposed Actions | 24 |
| 6 | References | 25 |

Appendices

Appendix A: QA:QC Data

Appendix B: NO₂ results for 2010

List of Tables

Table 1.1 Population projections for Down District Council 2009- 2012

Table 1.2 Air Quality Objectives included in Regulations

Table 1.3 Summary of previous reviews

Table 2 Details of Automatic Monitoring sites

Table 2.2 Details of Non- Automatic Monitoring Sites

Table 2.3 Results of Automatic Monitoring Data

Table 2.4 Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with
1-hour Mean Objective

Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes

List of Figures

Figure 1- map of Down District Council

Figure 2.1 Map of Automatic Monitoring site.

Figure 2.2 Map(s) of Non-Automatic Monitoring Sites within Downpatrick

Figure 2.3 Ballynahinch NO₂ site (Down 6)

Figure 2.4 Newcastle diffusion tube location

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

1 Introduction

1.1 Description of Local Authority Area

Down District Council comprises a largely rural area of around 65,000 hectares in the south east of Northern Ireland, with a population of some 68,000 (table 1).



Figure 1- map of Down District Council

Table 1.1 Population projections for Down District Council 2009- 2012

(www.nisra.gov.uk, accessed 23rd September 2009)

| | 2009 | 2010 | 2011 | 2012 |
|------------|--------|--------|--------|--------|
| Pop | 68,189 | 68,692 | 69,189 | 69,701 |

The table shows sustained population growth for Down District Council area. The main centres of population are located in Downpatrick, Newcastle and Ballynahinch. Agriculture and tourism form by far the most significant economic base in the area, with relatively little heavy industry. The Irish Sea and the inlet to Strangford Lough form a natural boundary for the south and east of the District. Much of this boundary has Area of Special Scientific Interest (ASSI) status. To the south of the District are the Mourne Mountains which may form the centre of Northern Ireland's first National Park. The Ards and Down Area Plan prepared under Part III of the Planning (Northern Ireland) Order 1991 will have future impacts on air quality within Down District Council. The Council has five neighbouring council areas: Ards Borough Council; Castlereagh Borough Council; Lisburn Borough Council; Banbridge District Council and Newry and Mourne District Council.

1.2 Purpose of Progress Report

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 Local Air Quality Management process.

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

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in 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 1.2. This table shows the objectives in units of microgrammes per cubic metre $\mu\text{g}/\text{m}^3$ (milligrammes per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Table 1.2 Air Quality Objectives included in Regulations for LAQM in Northern Ireland.

| Pollutant | Concentration | Measured as | Date to be achieved by |
|--|---|---------------------|------------------------|
| 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 mg/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 (PM₁₀) (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

Down District Council has completed the following reviews and assessments of air quality in earlier rounds of the assessment process:

Table 1.3- Summary of previous reviews

| | |
|--|--|
| Stage 1 Report (DDC, 2000) | The first stage assessment identified all significant pollutant sources with Down District Council area. The air quality objectives were unlikely to be exceeded and no detailed assessment was necessary. |
| Stage 2/3 Air quality review (DDC, 2003) | The conclusions of this review stated that there was no need to progress to the third stage review and assessment and that no Air Quality Management Areas (AQMA'S) needed to be declared. |
| Progress report (DDC, 2005) | The progress report concluded that NO ₂ , SO ₂ and PM ₁₀ were not predicted to cause exceedances of the air quality objectives at relevant receptors. |
| Updating and Screening Assessment (DDC, 2006) | The USA was carried out according to Local Air Quality Management Policy Guidance LAQM.TG(03). The assessment looked at seven pollutants and no detailed assessments were required. No AQMA's were required in Down District Council and there was no need for a detailed assessment in 2007. |
| Progress Report (EG, 2008) | <p>Diffusion tube monitoring indicated that the annual average objective for NO₂ was being exceeded at the Irish street location in Downpatrick. Down DC Officers evaluated sites with a view to installing real time monitoring equipment. There are currently no Air Quality Management Areas (AQMA'S) within the Down District Council area.</p> <p>Diffusion tube measurements made in the Irish Street area during 2007 and 2008 indicated exceedances in relation to NO₂. A detailed assessment involving additional diffusion tubes was commenced in late 2008 at this Irish Street location.</p> |

| | |
|--|---|
| Updating and Screening Assessment (DDC, 2009) | <p>The main conclusion from the 2009 Updating and Screening Assessment (USA) was that diffusion tube measurements at Irish Street junction, Downpatrick indicated exceedances of the annual mean objective for nitrogen dioxide in both 2007 and 2008. There is relevant exposure at this location. The measurement of nitrogen dioxide at the remaining monitoring sites has shown no exceedances of air quality objectives. Down District Council then undertook a Detailed Assessment for NO₂ in the vicinity of Irish Street.</p> |
| Detailed Assessment 2010 | <p>For the purposes of this Detailed Assessment additional NO₂ diffusion tubes were placed along Market Street, Irish Street, English Street and Church Street, Downpatrick. These additional tubes were installed in October 2008 and a full year of monitoring has now occurred. Following a bias adjustment of the diffusion tube results it was found that the tubes at Down 1 (Irish Street location) Down 11 (Church Street) and Down 13 (Market Street) exceeded the air quality limit of 40ug/m³ for Nitrogen Dioxide.</p> <p>Down District Council have committed to installing a real time analyzer on Market Street junction, Downpatrick, as local authorities are advised not to rely upon diffusion tube data alone to declare an Air Quality Management Area (A1.42 LAQM Technical Guidance LAQM .TG(09)). It is expected that this equipment will be operational at the beginning of June 2010 and the results obtained over the following six month period will influence Down District Council in declaring an Air Quality Management Area (AQMA).</p> <p>Down District Council are still awaiting acceptance of this Detailed Assessment by DOE.</p> |
| Progress report (DDC, 2010) | <p>Diffusion tube monitoring indicated that the annual average objective for NO₂ continued to exceed the objective at the Irish street location in Downpatrick, and that the intention was to install an automatic station at this site in June 2010 at relevant exposure.</p> |

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

An NO₂ realtime analyser was installed in Market Street Downpatrick in June 2010. Data has been available from this site since the 1st July 2010. The site is positioned to give the worst case scenario at relevant exposure.

Figure 2.1 Map of Automatic Monitoring Site



Table 2 Details of Automatic Monitoring Sites

| Site Name | Site Type | OS Grid Ref | | Pollutants Monitored | Monitoring Technique | In AQMA? | Relevant Exposure? (Y/N with distance (m) to relevant exposure) | Distance to kerb of nearest road (N/A if not applicable) | Does this location represent worst-case exposure? |
|---------------------------|-----------|-------------|--------|----------------------|----------------------|----------|--|---|---|
| Market Street Downpatrick | Roadside | 348655 | 344596 | NO2 | Chemiluminescence | NO | Y 10M | 1.5M | Y |

2.1.2 Non-Automatic Monitoring

Down District Council carries out monitoring of NO₂ by diffusion tubes at fourteen sites (one of which is a triplicate) within the District. Diffusion tube data cannot be compared directly with air quality limit values based on short-term averages; however, they can be used to help identify areas with high concentrations of NO₂, which require more detailed investigation. The aim of the NO₂ monitoring undertaken has been to measure pollutant concentrations at busy roads and junctions especially near residential areas. The tubes are sited using guidelines from NETCEN but are not part of the monitoring network. Up to November 2004, the NO₂ diffusion tubes were supplied and analysed by Ruddock and Sheratt. Since then, Eurofins have supplied and analysed the tubes. The tubes are currently prepared using 20% TEA in water.

Triplicate diffusion tubes have been located at the Irish Street junction in Downpatrick for a number of years. These were removed in July when the automatic site was installed in June 2010 and a co-location study is now being carried out. Additional diffusion tubes are also located at a variety of locations close to the Irish Street junction since October 2008. The diffusion tube studies for Down for the last five years shows an increasing level at the Irish Street site (see figure 2.5). Further information on the diffusion tube measurements and the QA/QC arrangements are given in Appendix A. Details of sites are given in figure 2.2 and table 2.2.

Figure 2.2 Map(s) of Non-Automatic Monitoring Sites within Downpatrick

OSNI copyright



Site for Irish Street triplicate tubes 2 M high beside window of 1st floor apartment at 5 Irish Street
(This site was discontinued in July 2010 when the automatic site was installed)



Sites approximately 50M and 100M from existing site (all single tubes)

Figure 2.3 Ballynahinch NO₂ site (Down 6) -



Figure 2.4 Newcastle diffusion tube location

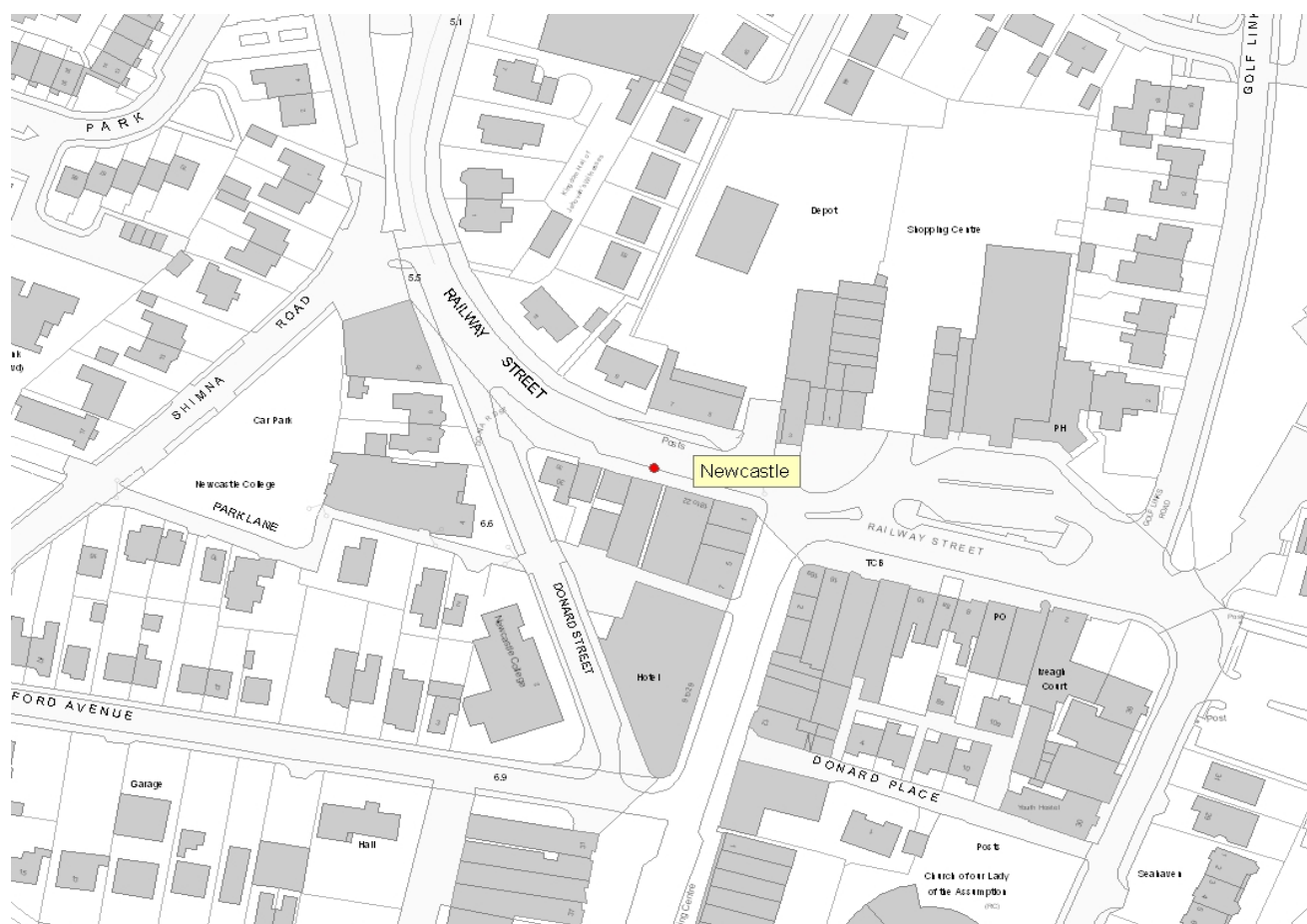


Table 2.2 Details of Non- Automatic Monitoring Sites

| Site Name | Site Type | Eastings | Northings | Pollutant 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? |
|---------------------------------|-----------|----------|-----------|---------------------|-----------|--|---|----------------------|
| DOWN1-Irish Street- Triplicate | Roadside | 348702 | 344448 | NO ₂ | N | Y | 1 | Y |
| DOWN2-St Patrick's Ave | Kerbside | 348542 | 344448 | NO ₂ | N | N | 1 | N/A |
| DOWN3- Orchard Way | B'ground | 348893 | 345903 | NO ₂ | N | Y | 1 | N/A |
| DOWN4- Stream Street | Kerbside | 348915 | 344207 | NO ₂ | N | N | 1 | N/A |
| DOWN5- Newcastle | Roadside | 337818 | 331601 | NO ₂ | N | Y | 0.5 | Y |
| DOWN6- Ballynahinch | Roadside | 336592 | 352216 | NO ₂ | N | Y | 2 | Y |
| DOWN7-St Patrick's Drive | B'ground | 348605 | 344205 | NO ₂ | N | Y | 1 | N/A |
| DOWN8-English Street | Roadside | 348605 | 344664 | NO ₂ | N | Y | 6 | N |
| DOWN9- Irish Street triplicate | Roadside | 348702 | 344448 | NO ₂ | N | Y | 1 | Y |
| DOWN10- Irish Street Triplicate | Roadside | 348702 | 344448 | NO ₂ | N | Y | 1 | Y |
| DOWN11- Church St (50m) | Roadside | 348422 | 344646 | NO ₂ | N | Y | 1 | Y |
| DOWN12- Church St (100m) | Roadside | 348664 | 344744 | NO ₂ | N | Y | 1 | Y |
| DOWN13- Market Street (50m) | Roadside | 348686 | 344509 | NO ₂ | N | Y | 1 | Y |
| DOWN14- Market St (100m) | Roadside | 348598 | 344531 | NO ₂ | N | Y | 1 | Y |
| DOWN15-Irish St (50m) | Roadside | 348702 | 344609 | NO ₂ | N | Y | 1 | Y |
| DOWN16- Irish St (100m) | Roadside | 348735 | 344566 | NO ₂ | N | Y | 1 | Y |

2.2 Comparison of Monitoring Results with Air Quality Objectives

In the following sections, statistics are presented for Nitrogen Dioxide (NO₂), derived from the automatic station and diffusion tube measurements. These statistics are compared with the objectives for the different pollutant (see table 1-2) to identify exceedances. Down District Council does not carry out any monitoring for other pollutants.

2.2.1 Nitrogen Dioxide

Automatic Monitoring Data

Table 2.3 Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with Annual Mean Objective

| Site ID | Location | Within AQMA ? | Data Capture for monitoring period ^a % | Data Capture for full calendar year 2010 ^b % | Annual mean concentrations (µg/m ³) | | |
|-------------|-------------------|---------------|---|---|---|----------------------|-------------------|
| | | | | | 2008 ^{c, d} | 2009 ^{c, d} | 2010 ^c |
| Downpatrick | 2-8 Market Street | N | 50 | 50 | N/A | N/A | 35.36(a) |

(a)-The Automatic site was installed in June 2010 therefore only 6 months data is available, this figure is an estimation of the annual mean in accordance with 3.16 of the Technical Guidance (09). A table of this method can be found in Appendix C. Unfortunately there was not two background sites within a 50 mile radius to estimate the data, as recommended in TG(09) and therefore there is an increased level of uncertainty of the result.

Table 2.4 Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour Mean Objective

| Site ID | Location | Within AQMA? | Data Capture for monitoring period ^a % | Data Capture for full calendar year 2010 ^b % | Number of Exceedences of hourly mean (200 µg/m ³) | | |
|-------------|-------------------|--------------|---|---|---|-------------------|-------|
| | | | | | 2008 ^c | 2009 ^c | 2010 |
| Downpatrick | 2-8 Market Street | N | | 50 | N/A | N/A | 2 (a) |

(a)-Automatic site installed in June 2010 therefore only 6 months data available

In the following section monitoring results are presented for all diffusion tube sites and comparison made with the objective.

Diffusion Tube Monitoring Data

Down District Council currently have 14 monitoring locations for NO₂, and one location uses triplicate tubes. Detailed NO₂ monitoring commenced at the end of 2008 in the vicinity of Irish Street, Downpatrick. There were sensitive receptors at the Irish Street location. A bias adjustment factor of 0.84 was used in 2010. This was taken from the bias-adjustment spreadsheet available from the LAQM page of the National Air Quality website

[http://laqm.defra.gov.uk/documents/Diffusion Tube Bias Factors v04 11 v6.xls](http://laqm.defra.gov.uk/documents/Diffusion_Tube_Bias_Factors_v04_11_v6.xls)

.

There was less than 90% data capture at Down 1, Irish street, this was due to the site being discontinued in June 2010. A number of other sites had less than 90% data capture due to these diffusion tubes being located in populated areas and were destroyed or stolen on 2 or more occasions during 2010.

The NO₂ diffusion tube data are summarised in the table 2.4. The full dataset (monthly mean values) are included in Appendix B.

The 2010 diffusion tube results show three sites within Downpatrick town centre where exceedences of the annual mean NO₂ objective are occurring:

Site Down 1 – Irish Street

Site Down 11- Church Street 50m from Down1

Site Down 13- Market Street 50m from Down1

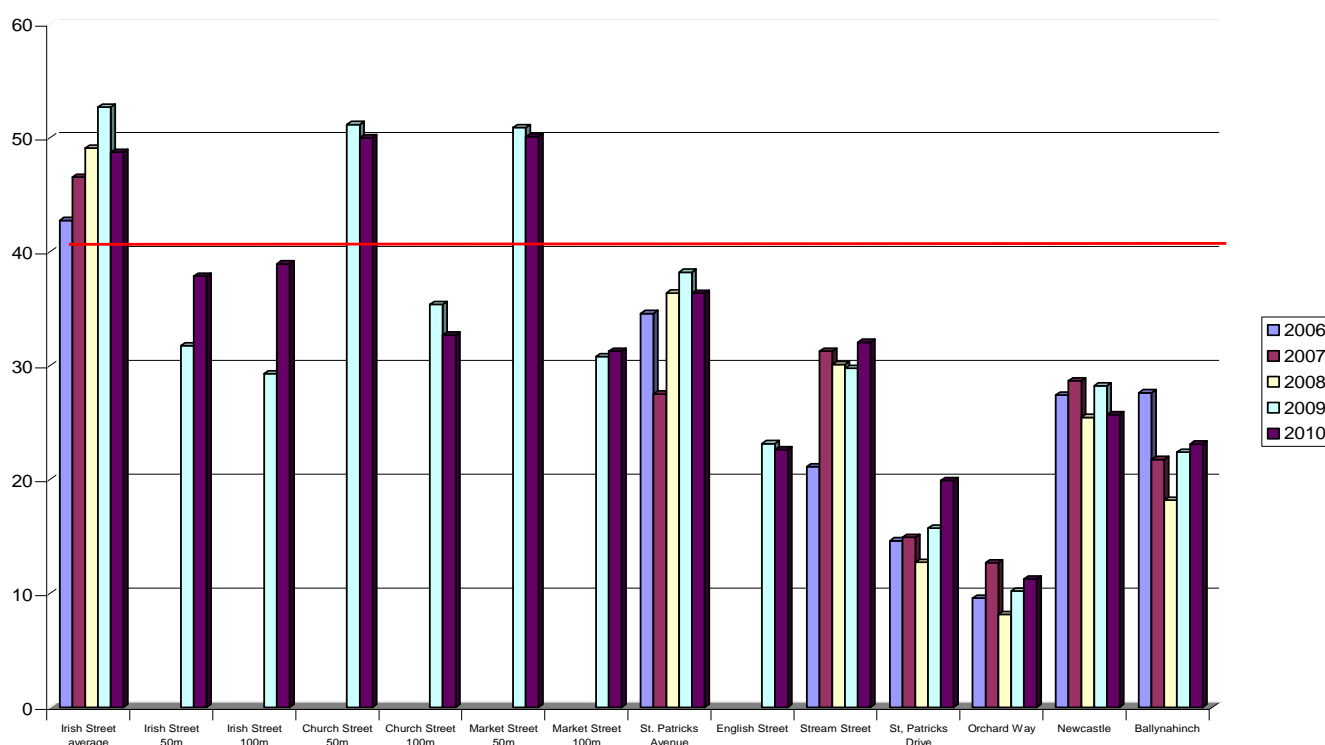
Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes

| Site ID | Location | Within AQMA? | Data Capture for monitoring period % | Data Capture for full calendar year 2010 % | Annual mean concentrations ($\mu\text{g}/\text{m}^3$) | | |
|---------|---------------------------|--------------|--------------------------------------|--|---|-----------|-----------------|
| | | | | | 2008 | 2009 | 2010 |
| Down 1 | Irish Street (average)(a) | N | 50 | 50 | 49. | 53 | 42.40(c) |
| Down 2 | St. Patricks Avenue | N | 100 | 100 | 36 | 38 | 36 |
| Down 3 | Orchard Way | N | 100 | 100 | 8 | 10 | 11 |
| Down 4 | Stream Street | N | 83 | 83 | 30 | 30 | 32 |
| Down 5 | Newcastle | N | 100 | 100 | 25 | 28 | 26 |
| Down 6 | Ballynahinch | N | 83 | 83 | 18 | 22 | 23 |
| Down 7 | St, Patricks Drive | N | 100 | 100 | 13 | 16 | 15 |
| Down 8 | Killyleagh (b) | | N/A | N/A | 19 | N/A | N/A |
| Down 8 | English Street | N | 83 | 83 | N/A | 23 | 23 |
| Down11 | Church Street 50m | N | 92 | 92 | N/A | 51 | 50 |
| Down12 | Church Street 100m | N | 100 | 100 | N/A | 35 | 33 |
| Down13 | Market Street 50m | N | 75 | 75 | N/A | 51 | 50 |
| Down14 | Market Street 100m | N | 92 | 92 | N/A | 31 | 31 |
| Down15 | Irish Street 50m | N | 92 | 92 | N/A | 32 | 38 |
| Down16 | Irish Street 100m | N | 83 | 83 | N/A | 29 | 39 |

(a) discontinued in July2010

(b)- removed in October 2008

(c) Estimated annual data as only 6 months data available method used included in Appendix B

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

2.2.2 PM₁₀

Down District Council does not carry out monitoring for PM₁₀ pollution at this time.

2.2.3 Sulphur Dioxide

Down District Council ceased monitoring for Sulphur Dioxide in Ballynahinch during 2006. There were no exceedences of the air quality objectives for SO₂ at this site.

2.2.4 Benzene

Down District Council does not carry out monitoring for Benzene at this time.

2.2.5 Summary of Compliance with AQS Objectives

Down District Council have measured concentrations of Nitrogen Dioxide above the annual mean objective at relevant locations during 2010. Down District Council has submitted a Detailed Assessment in April 2010, for the area centred on Irish Street, Downpatrick. Down District Council installed a real time analyser in June 2010 at the worst case scenario within this location. Monitoring showed no exceedences of the objective in the first six months of monitoring, and the estimated annual data was also below the objective. Down District Council has decided not to declare an AQMA on the basis the realtime data is more accurate and a co-location study is now being carried to help supply more accurate data from the surrounding diffusion tube sites.

3 New Local Developments

3.1 Road Traffic Sources

Down District Council confirms that there are no new or newly identified road traffic sources which may affect air quality within its local authority area.

3.2 Other Transport Sources

Down District Council confirms that there are no new or newly identified other transport sources which may affect air quality within its local authority area.

3.3 Industrial Sources

Down District Council confirms that there are no new or newly identified industrial sources which may affect air quality within its local authority area.

3.4 Commercial and Domestic Sources

Down District Council confirms that there are no new or newly identified commercial and domestic sources which may affect air quality within its local authority area.

3.5 New Developments with Fugitive or Uncontrolled Sources

There are no new landfill sites, quarries, unmade roads, waste transfer stations or other potential sources of fugitive particulate emissions within Down District Council area.

Down District Council confirms that there are no new or newly identified local developments which may have an impact on air quality within the Local Authority area.

4 Planning Applications

There are no approved Planning applications which could impact upon air quality within Down District Council area.

5 Conclusions and Proposed Actions

5.1 Conclusions from New Monitoring Data

The results for NO₂ show that there are breaches of the objective in 2010, of 40ug/m³ at Down 11 (Church Street) and Down 13(Market Street) in the vicinity of the Irish Street and Market Street junction in Downpatrick town centre. There are residential properties at elevated heights ranging from 2 - 4 metres from road level at these locations. There are no breaches of the objective limit at the other sites within Downpatrick. The wide variation with the monthly results from the diffusion tube sites, within the town centre introduced a degree of uncertainty over a decision to declare an AQMA in 2010. An ideal location had been identified within this area to site an automatic station for NO₂. Installation of this analyser was completed in June 2010 and six months data is now available, the results show a significant reduction in levels, bringing them well below the objective. The original triplicate diffusion tube site was discontinued at the time, and a co-location study is now being carried out. This will help give more accurate data from the other NO₂ diffusion tube sites within the area.

5.2 Conclusions relating to New Local Developments

N/A

5.3 Proposed Actions

Down District Council has decided to fund a further 12 months monitoring within the area of Irish Street, Downpatrick town centre to continue obtaining more accurate data. An Updating and screening assessment will be carried out in 2012.

6 References

Diffusion Tubes for Ambient NO₂ Monitoring: **Practical Guidance for Laboratories and Users** – AEA

DDC (2009) **Air Quality Update and Screening and Assessment**. DDC, October 2009.

DDC (2009) **Air Quality Update and Screening and Assessment**. DDC, October 2009.

DDC (2010) **Detailed Assessment for NO₂ at Market Street/Irish Street junction, Downpatrick**

Defra (2007). **The Air Quality Strategy for England, Scotland, Wales and Northern Ireland**. <http://www.defra.gov.uk/environment/airquality/strategy/> (Accessed April 2010)

EG (2008) **Eastern Group Air Quality Progress Report**. Annual report on air quality in the Eastern group of local authorities in Northern Ireland, April 2008.

TG (2009) **Part IV of the Environment Act 1995. Local Air Quality Management: Technical Guidance LAQM.TG(09)**. Guidance prepared by the Department for Environment, Food and Rural Affairs and the Devolved Administrations, February 2009.

Appendices

Appendix A: QA/QC Data

Appendix B: NO₂ results for 2010

Appendix C : NO₂ annualisation of data for Irish Street

Appendix A: QA:QC Data

QA/QC of automatic monitoring

Down District Council commissioned Monitor Europe to provide the QA/QC of the automatic measurements of NO₂ from the Market Street site, this is supplied on a monthly basis. Local authority staff act as the local site operator and visit the site on a fortnightly basis carrying out any manual calibration or filter changes required. An audit of the site is carried out by AEA Technology on a six monthly basis.

QA/QC of diffusion tube monitoring

The tubes are supplied by Bureau Veritas labs and the preparation method is 20% TEA in water and analysed by Eurofins Bureau Veritas Laboratories and Eurofins have demonstrated satisfactory performance in the WASP scheme for analysis of NO₂ diffusion tubes.

http://www.laqmsupport.org.uk/Summary_of_Laboratory_Performance_in_WASP_R103-107.pdf

Diffusion Tube Bias Adjustment Factors

Down District Council obtained the appropriate bias factor from the Review and Assessment Website. A factor of 0.84 was taken from the drop down menus available on the excel spreadsheet matrix. Information regarding Eurofins Bias Adjustment can be viewed at:

http://laqm.defra.gov.uk/documents/Diffusion_Tube_Bias_Factors_v04_11_v6.xls

Discussion of Choice of Factor to Use

Down District Council Council used the national bias adjustment factor of 0.84, published on the Review and Assessment helpdesk. A co-location study is carried out at the automatic site in Downpatrick but this only commenced in July 2010 and therefore only 6 months data available. There are 4 co-location studies carried out within the local Eastern Group area and the average of these is 0.84, and therefore a decision was made to use the National figure.

PM Monitoring Adjustment

Not applicable.

Short-term to Long-term Data adjustment

Not applicable.

Appendix B- NO2 results for 2010 and method of estimated annual mean concentration for Irish Street NO2 diffusion tube site

2010 LAB RESULTS FOR NO₂- BIAS NOT APPLIED

| | | | | | | | | | | | | | |
|---------|---------------------|----|----|----|----|----|----|----|----|----|----|----|----|
| Down 1 | Irish Street | 61 | 68 | 71 | 66 | 46 | 36 | | | | | | |
| Down 4 | Irish Street 50m | 43 | 55 | 53 | 66 | 49 | 38 | 28 | 45 | 32 | 38 | 47 | 46 |
| Down 5 | Irish Street 100m | 42 | 55 | 68 | 63 | 44 | | | 40 | 30 | 34 | 44 | 44 |
| Down 6 | Church Street 50m | 64 | 86 | 70 | 66 | | 37 | 39 | 51 | 51 | 51 | 69 | 71 |
| Down 7 | Church Street 100m | 46 | 66 | 57 | 45 | 26 | 18 | 18 | 23 | 33 | 38 | 52 | 45 |
| Down 8 | Market Street 50m | 70 | 94 | 69 | 54 | | 35 | 36 | | | 55 | 66 | 58 |
| Down 9 | Market Street 100m | 43 | 52 | 40 | 39 | 27 | 14 | 16 | | 44 | 42 | 48 | 44 |
| Down 10 | St. Patricks Avenue | 49 | 57 | 54 | 44 | 31 | 37 | 26 | 29 | 39 | 49 | 51 | 53 |
| Down 11 | English Street | 31 | 40 | 36 | 32 | 16 | 15 | 16 | | | 25 | 32 | 27 |
| Down 12 | Stream Street | 35 | 46 | 59 | 52 | 34 | | | 17 | 28 | 33 | 40 | 37 |
| Down 13 | St, Patricks Drive | 25 | 30 | 26 | 23 | 12 | 4 | 10 | 8 | 13 | 20 | 25 | 23 |
| Down 14 | Orchard Way | 19 | 18 | 18 | 13 | 7 | 23 | 6 | 6 | 8 | 11 | 20 | 13 |
| Down 15 | Newcastle | 32 | 38 | 36 | 44 | 28 | 21 | 28 | 28 | 25 | 30 | 29 | 29 |
| Down 16 | Ballynahinch | 34 | 47 | 37 | 29 | | 15 | 12 | 21 | 17 | 25 | 38 | |

2010 Lab Results for NO₂ –Bias applied

| | | | | | | | | | | | | | |
|---------|---------------------|----|----|----|----|----|----|----|----|----|----|----|----|
| Down 1 | Irish Street | 51 | 57 | 60 | 56 | 39 | 30 | | | | | | |
| Down 4 | Irish Street 50m | 36 | 46 | 45 | 56 | 41 | 32 | 24 | 38 | 27 | 32 | 40 | 39 |
| Down 5 | Irish Street 100m | 35 | 46 | 57 | 53 | 37 | 0 | 0 | 33 | 25 | 28 | 37 | 37 |
| Down 6 | Church Street 50m | 54 | 72 | 59 | 55 | 0 | 31 | 33 | 43 | 43 | 43 | 58 | 60 |
| Down 7 | Church Street 100m | 39 | 56 | 48 | 38 | 22 | 15 | 15 | 19 | 28 | 32 | 44 | 38 |
| Down 8 | Market Street 50m | 59 | 79 | 58 | 46 | 0 | 29 | 30 | 0 | 0 | 46 | 56 | 48 |
| Down 9 | Market Street 100m | 36 | 44 | 34 | 33 | 23 | 12 | 14 | 0 | 37 | 35 | 40 | 37 |
| Down 10 | St. Patricks Avenue | 41 | 48 | 45 | 37 | 26 | 31 | 22 | 24 | 33 | 41 | 43 | 44 |
| Down 11 | English Street | 26 | 33 | 30 | 27 | 13 | 13 | 13 | 0 | 0 | 21 | 26 | 23 |
| Down 12 | Stream Street | 29 | 39 | 50 | 44 | 28 | 0 | 0 | 14 | 23 | 28 | 34 | 31 |
| Down 13 | St, Patricks Drive | 21 | 25 | 22 | 19 | 10 | 4 | 8 | 7 | 11 | 17 | 21 | 19 |
| Down 14 | Orchard Way | 16 | 15 | 15 | 11 | 6 | 19 | 5 | 5 | 6 | 9 | 16 | 11 |
| Down 15 | Newcastle | 27 | 32 | 30 | 37 | 23 | 18 | 23 | 24 | 21 | 25 | 24 | 24 |
| Down 16 | Ballynahinch | 29 | 39 | 31 | 24 | 0 | 13 | 10 | 17 | 14 | 21 | 32 | 0 |

Method of estimated annual mean concentration for Irish Street NO2 diffusion tube site

| Site ID | Location | Within AQMA ? | Data Capture for monitoring period ^a % | Data Capture period 2010 ^b | Period concentrations (µg/m ³) |
|-------------|--------------|---------------|---|--|--|
| | | | | | 2010 ^c |
| Downpatrick | Irish Street | N | 50 | 1 st Jan -30 th June | 48.74 |

| Long Term background site with more than 90% data capture for 2010 | Distance from Irish Street site | Annual Mean 2010 | Period mean 2010 | Ratio AM/PM |
|--|---------------------------------|------------------|----------------------|-------------|
| Orchard Way | 3miles | 11.25 | 13.68 | 0.822 |
| Belfast Central | 1/2mile | 15.33 | 16.78 | 0.914 |
| | | | Ratio average | 0.87 |

ie: Irish Street annual estimated data for 2010 is 42.40ug/m3

(The period mean 48.74 ug/m3 x 0.87 = 42.40ug/m3)

Appendix C- Method of estimated annual mean concentration for Irish Street NO2 automatic site

| Site ID | Location | Within AQMA ? | Data Capture for monitoring period ^a % | Data Capture period 2010 ^b | Period concentrations (µg/m ³) |
|-------------|-------------------|---------------|---|--|--|
| | | | | | 2010 ^c |
| Downpatrick | 2-8 Market Street | N | 50 | 1 st July -31 st Dec | 34 |

| Long Term site with more than 90% data capture for 2010 | Distance from Irish Street site | Annual Mean 2010 | Period mean 2010 | Ratio AM/PM |
|---|---------------------------------|------------------|----------------------|-------------|
| Derry Brooke Park (a) | 97 miles | 19.6 | 18.83 | 1.017 |
| Belfast Central | 27 miles | 35.54 | 33.2 | 1.07 |
| | | | Ratio average | 1.04 |

(a) Only other background site available so there will be an uncertainty with the results as this site is not within the recommended 50 miles.

ie: Irish Street annual estimated data for 2010 is 35.36ug/m3

(The period mean 34 ug/m3 x 1.04 = 35.36ug/m3)