North Down Borough Council 2nd/3rd Stage Review Of Air Quality Interim Report.

Marcus G. Potts 18/12/2003

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INTRODUCTION

PURPOSE

This report follows on from the first stage review and assessment of air quality produced by North Down Borough Council in September 2000 and is an interim report on the second and third stage reviews and assessments that are ongoing and for which sufficient reliable data should be available for completion during summer 2004. These reviews and assessments are being conducted for nitrogen dioxide, Sulphur dioxide and fine particles (PM10).

THE NATIONAL AIR QUALITY STRATEGY

In 1997 the Government published the National Air Quality Strategy (NAQS), which was reviewed in 2000. This was required by the Environment Act 1995 which placed a duty on Government to prepare and publish a Strategy for the assessment and management of air quality. The Act also required the Government to review policies relating to air quality and modify the Strategy as necessary.

The aim of the Strategy is to "ensure that everyone can enjoy a level of ambient air quality in public places which poses no significant risk to health or quality of life" (DETR, 2000). The Strategy includes statements relating to standards for the quality of air, objectives restricting the concentrations of specific harmful substances in the air, and the measures to be taken by local authorities and other persons for the purpose of achieving those objectives. As outlined in DETR 2000, for the purposes of the National Air Quality Strategy:

"Standards are the concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on assessment of the effects of each pollutant on human health including the effects on sensitive groups"; and

"Objectives are policy targets, expressed as maximum ambient concentrations to be achieved, either without exception or with a permitted number of exceedences, within a specified timescale."

The strategy objectives have been based on recommendations made by the Expert Panel on Air Quality Standards, and standards based on information provided by the World Health Organisation. The air quality standards are based on scientific and medical evidence of the effects of pollutants as minimum or zero risk levels. The objectives have been produced taking into account technical feasibility, and costs and benefits.

THE 7 MAIN POLLUTANTS OF CONCERN IDENTIFIED IN THE CURRENT AIR QUALITY OBJECTIVES

Pollutant	Objective Maximum Concentration*	Objective Measured As	To be Achieved By
Benzene	16.25 µg/m3 (5 ppb)	Running Annual Mean	31-Dec-03
1,3 Butadiene	2.25 µg/m3 (1 ppb)	Running Annual Mean	31-Dec-03

Carbon Monoxide	11.6 mg/m3 (10 ppm)	Running Annual 8-hour Mean	31-Dec-03
Lead	0.5 µg/m3	Annual Mean	31-Dec-04
Lead	0.25 µg/m3	Annual Mean	31-Dec-08
Nitrogen Dioxide	200 µg/m3 (105 ppb) (not to be exceeded more than 18 times a year)	1-hour mean	31-Dec-05
Nitrogen Dioxide	40 µg/m3 (21 ppb)	Annual Mean	31-Dec-05
Particulates (PM10)	50 µg/m3 (not to be exceeded more than 35 times a year	24-hour mean	31-Dec-04
Particulates (PM10)	40 µg/m3	Annual Mean	31-Dec-04
Sulphur Dioxide	350 µg/m3 (132 ppb) (not to be exceeded more than 24 times a year)	1-hour mean	31-Dec-04
Sulphur Dioxide	125 µg/m3 (47ppb) (not to be exceeded more than 3 times a year)	24-hour mean	31-Dec-04
Sulphur Dioxide	266 µg/m3 (100 ppb) (not to be exceeded more than 35 times a year)	15-minute mean	31-Dec-05

* Conversions of ppb and ppm to µg/m3 and mg/m3 at 20oC and 1013 mb.

REVIEW AND ASSESSMENT

The complexity and detail of a review and assessment should be consistent with the risk of air quality objectives not being achieved by the year 2005. In the first instance the local authority should carry out initial screening of industrial, transport and any other significant sources of pollution within their locality (first stage review and assessment). By using simple screening techniques, it will be possible to determine which areas should be the focus of a local authority's attention. In areas well below the air quality objective it may not be necessary to undertake any further investigation, except for a further assessment of air quality nearer the year 2005 to ensure that there has been no significant decline in air quality.

If exceedances do, or are likely to exist, and there is the potential for human exposure over the specified averaging period for a pollutant, the authority should proceed to a second stage assessment. In areas where there is the potential risk of elevated levels of a pollutant, a local authority will be required to estimate ground level concentrations at the roadside and at industrial and background locations within their area. This will enable the local authority to predict the highest potential pollution concentrations. The approach is intended to be precautionary.

If there is no risk that an objective will not be achieved, a local authority can be confident that an Air Quality Management Area will not be necessary. However, if by 2005, it is likely that the standard will be approached or exceeded, a local authority should proceed to the third stage.

LEGAL BACKGROUND

Part IV of the Environment Act 1995 required local authorities in England and Wales to undertake new duties for local air quality management. These new duties commenced at the end of 1997. Local authorities were required undertake a review and assessment of air quality within their areas.

Where air quality objectives will not, or are unlikely to be met by the year 2005, the authority will be required to designate an Air Quality Management Area and draw up an Action Plan to remedy the situation. A minimum of two air quality reviews are recommended in order to assess compliance with air quality objectives, one to assess air quality at the outset of the National Air Quality Strategy and a second to be carried out towards the end of the time scale of 2005.

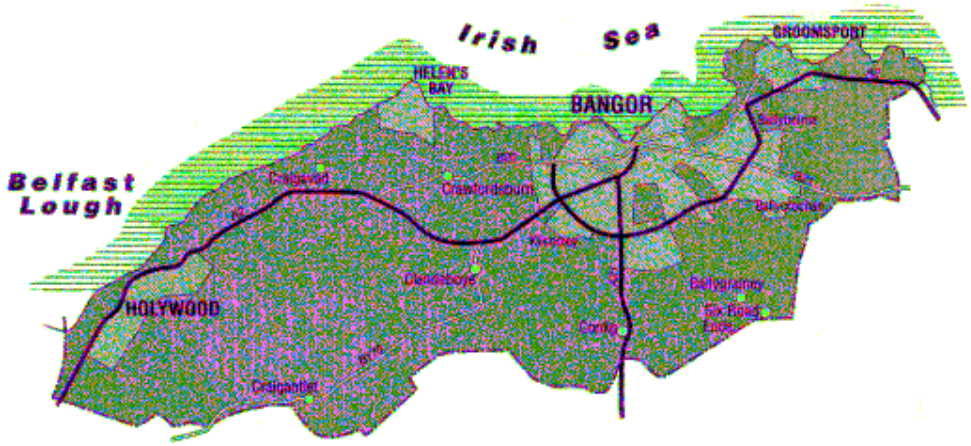
NORTHERN IRELAND

The above statutory framework was not enacted for Northern Ireland along with the rest of the UK. However, after discussion with the DOE Environment and Heritage Service a number of Boroughs within the province undertook to carry out a first stage review, which was completed by North Down Borough Council in September 2000. It was envisaged that the legal framework for local authority air quality management would be put in place in the near future in order to bring the province into line with the rest of the UK. This implied tightened time scales for the work required to complete the reviews having embarked on the process a full three years after the rest of the UK.

The Environment (Northern Ireland) Order 2002 provides the framework for local air quality management across Northern Ireland. The provisions in Part III of the Order put a duty on local authorities to carry out reviews of air quality in their areas. It empowers local authorities to declare Air Quality Management Areas and allows the Department to grant aid air quality work by local Authorities. It also gives the Department powers of sanction against any local authority failing to discharge its duties under the order.

PROFILE OF NORTH DOWN

The Borough of North Down is geographically one of the smallest Council areas in Northern Ireland, but is regarded as economically one of the wealthiest. Population has increased steadily over recent years and is now in the region of 77,800.



Air Quality in North Down is generally good as there is good ventilation from sea breezes. There are few industrial processes in the area that are significantly detrimental to air quality and heavy fuel oil is not widely used for heat generation.

There is significant use of solid fuel within the Borough for domestic heating. Solid Fuel use was subjected to evaluation in accordance with DETR guidance. In addition, there is 25 years of data from smoke and So_2 bubbler sites that have been located in Bangor and Holywood. Studies in relation to solid fuel use within the 1st stage review indicated that there was a risk of exceedances of the air quality objectives in relation to SO_2 and PM_{10}.

There are a number of very busy trunk roads in the area as indicated on the above map. Studies in relation to traffic flows on these roads indicated the possibility of exceedances of the objectives in relation to NO_2 and PM_{10} at relevant locations particularly in relation to the A2 to Belfast

CONCLUSIONS OF THE FIRST STAGE REVIEW AND ASSESSMENT

- Further investigation should take the form of monitoring and screening modelling within a stage 2 assessment in accordance with government guidance. The monitoring is likely to require the purchase of automatic sampling and measurement equipment for the purpose. It may be possible to do this in co-operation with other authorities to mitigate the cost of the equipment.

  In addition to the above the Department has had tentative meetings with Belfast City Council, Castlereagh BC, Lisburn BC, Newtownabbey BC and Carrick BC, with a view to extending the Greater Belfast Emissions inventory which already takes in Holywood. This would provide valuable base line information to guide future air quality strategies for the area.

These early meetings lead to the formation of the Greater Belfast Air Quality Partnership, which comprises BelfastCC, CarrickfergusBC, CastlereaghBC, LisburnCC, NewtownabbeyBC and North DownBC. This group has been highly influential with regard to the approach taken by its members and has been very useful as a forum to discuss air quality matters. In addition, the cooperation of the members of the partnership has enabled joint bids for funding from the Department of the Environment, Environment and Heritage Service. This funding has greatly assisted in the progression of the reviews and assessments of Local Authorities within Northern Ireland.

APPROACH TO THE 2ND/3RD STAGE REVIEWS BY NORTH DOWN BOROUGH COUNCIL

FINDINGS OF THE FIRST ASSESSMENT

The first stage review and assessment of air quality in North Down Borough Council Area examined matters, which might lead to a **risk** of an air quality objective being exceeded. The study identified three pollutants where the **risks** identified warranted further investigation. Namely Nitrogen dioxide (mainly from roads sources), Sulphur dioxide (mainly from burning coal) and particulate matter (from coal burning and road vehicles).

APPROACH SUGGESTED BY THE GUIDANCE

The **Review and assessment:Technical Guidance LAQM.TG(02)** published by DEFRA in October 2002 states that 2nd/3rd stage reviews should provide an accurate assessment of the **likelihood** of an air quality objective being exceeded at locations with relevant exposure. This should be sufficiently detailed to allow the designation or amendment of any necessary AQMAs.

The **Review and assessment:Technical Guidance LAQM.TG(02)** also states that the first round of reviews and assessments highlighted the importance of considering public exposure, and the need for local authorities to focus upon those locations where they expect pollutant concentrations to be highest (sometimes referred to as 'hot-spots'). It is likely to be more cost effective to start with an examination of worst-case locations and then work outward if exceedences are found, rather than take an unfocussed look at a large geographical area. If there is no exceedence at the most polluted location, there should be no exceedences elsewhere. This approach should also help ensure that potential areas of exceedence are not missed. The guidance further states that local authorities should use quality-assured monitoring and validated modeling methods to determine current and future pollutant concentrations in areas where there is a significant risk of exceeding an air quality objective.

ACTION TAKEN BY NDBC IN SUPPORT OF THE APPROACH

It was with the above approach in mind that North Down Borough Council located a Smoke and SO_2 bubbler at the junction of Church Street/Clandeboye in February 2001 road as a result of the findings of the 1st stage review and assessment. This area was identified as the most densely populated 1km^2 in the Borough as a result of the first review as well as having a high proportion of homes heated using solid fuel. In addition, local knowledge suggested that this area tended to be smokier and have poorer air quality than other areas in the Borough. Also at this time the Site at Sullivan Upper School in Holywood and at the junction of Church Street/Clandeboye Rd were added to the national network, in order to ensure adequate quality control of the results from these two sites.

Also at this time additional NO2 passive sampling tubes were located along the A2 in an effort to gather roadside emissions data along the Boroughs busiest road.

Legend

<all other values>

NO2 & PM10 AUTOMATIC

NO2 DIFFUSION TUBE

PM10 & SO2 AUTOMATIC MONITORING STATION

SO2 AND SMOKE BUBBLER

Late in 2001 the Department made grant funds available to progress the review and assessment process. North Down Borough Council successfully bid for funds to install two automatic real time monitoring sites. These were located at Marine Parade Holywood, to measure NO2 and PM10 mainly from road sources and near the junction of Church Street/Clandeboye Road to measure SO2 and PM10 mainly from domestic coal burning. The air quality monitoring equipment in use by North Down Borough Council is marked on the aerial photograph above. The two automatic real time monitoring sites are marked on the aerial photographs below.

In addition, funding was granted for a detailed fuel use survey in the 1km^2 adjacent to the Church Street/Clandeboye Road area as part of a joint bid with other authorities. This was invaluable as the most recent fuel use survey for the area was carried out as a result of 1981 census. This survey fund that 78% of respondents used an oil boiler to heat the home, with only 11.4% using an open fire as the primary heat source. However, 53% used an open fire as a back up appliance in addition to the 11.4% who used an open fire as a primary heat source. This high level of solid fuel use is reflected in the results of the Smoke and SO2 bubbler site monitoring in the area since Feb 2001 and the results from the Automatic monitoring site since March 2003.

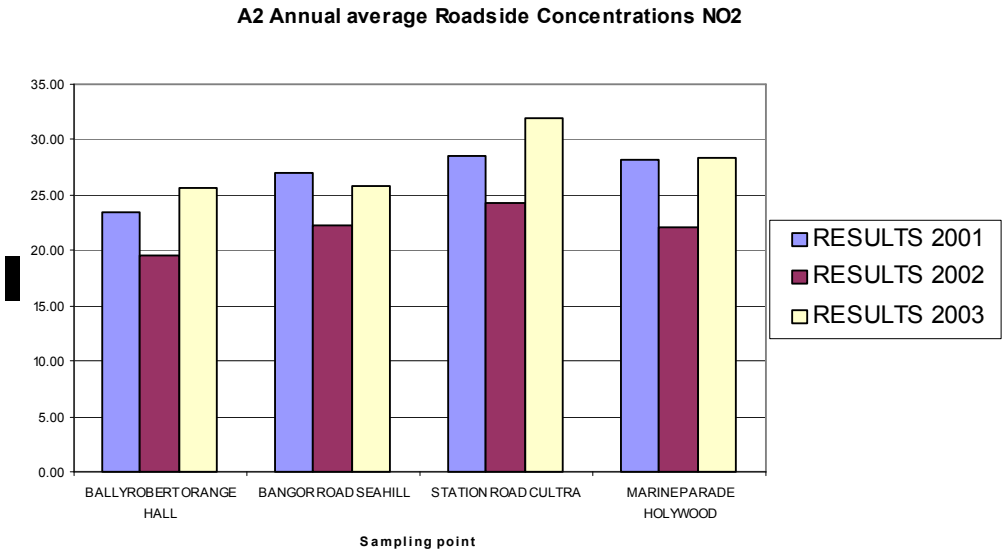
In year two of the Grant funding process the Council Bid for GIS software to display the results of monitoring, emissions inventories and modeling to be carried out by Belfast CC. Emit software from Cambridge Environmental Research Consultants was obtained as a joint bid in order to collate the emissions inventory for the area. A joint bid was also successful for a fuel use survey covering all the populous areas within the Borough. This survey revealed that overall 77% of respondents use an oil boiler to heat the home with only 4% using coal as a primary means of heating with a further 3% using smokeless fuel. 20% of respondents used coal as a secondary means of heating with a further 5% using smokeless solid fuel. These figures represent a lower level of solid fuel use than in the detailed study of 1km$_2$ adjacent to the Church Street/Clandeboye Road area. However once mapped to postcode and the 0.5Km^2 grid and modeled using ADMS the results of both surveys will provide invaluable information on possible “hot spots” of pollutants not identified in the 1st stage review. In addition the information will help to inform future land use planning and transportation issues.

In order to consolidate the information from the monitoring data and in order to ensure that it is valid pending the final review report, North Down Borough Council successfully bid for calibration and data handling expertise from NETCEN. This contract will review data gathered to data as well as future data. This contract will be very useful in ensuring the accuracy of the results.

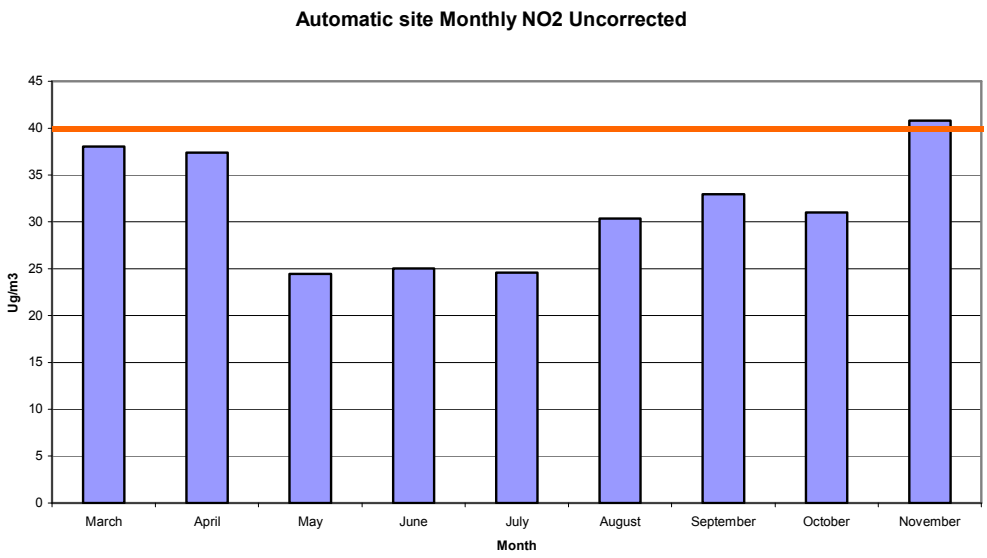
RESULTS

The following are the results so far in relation to the three Pollutants Identified in the 1st stage review as warranting further investigation. These results are raw data and have not been corrected for lab bias in the case of NO2 results, or calibration corrections QA/QC and data ratification in the case of data from the Automatic Monitoring sites.

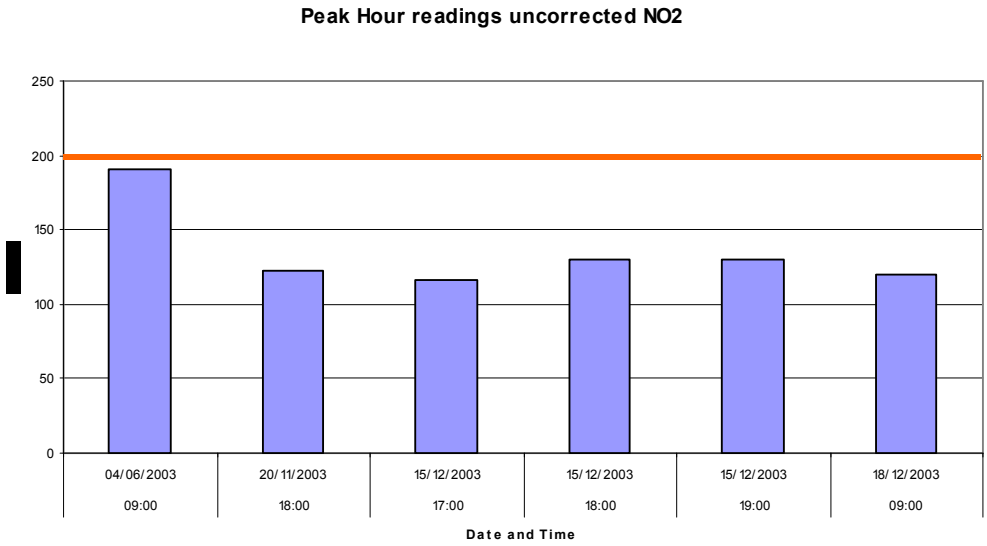
NITROGEN DIOXIDE



The above are the annual average roadside concentrations at the above locations (marked by yellow triangles on the aerial photography). The results include only months August to December for 2001 and January to October for 2003 and have not been corrected for lab bias nor from co location studies. Additional NO2 have been mounted on the Automatic site at Marine parade for this purpose but no results are yet available.

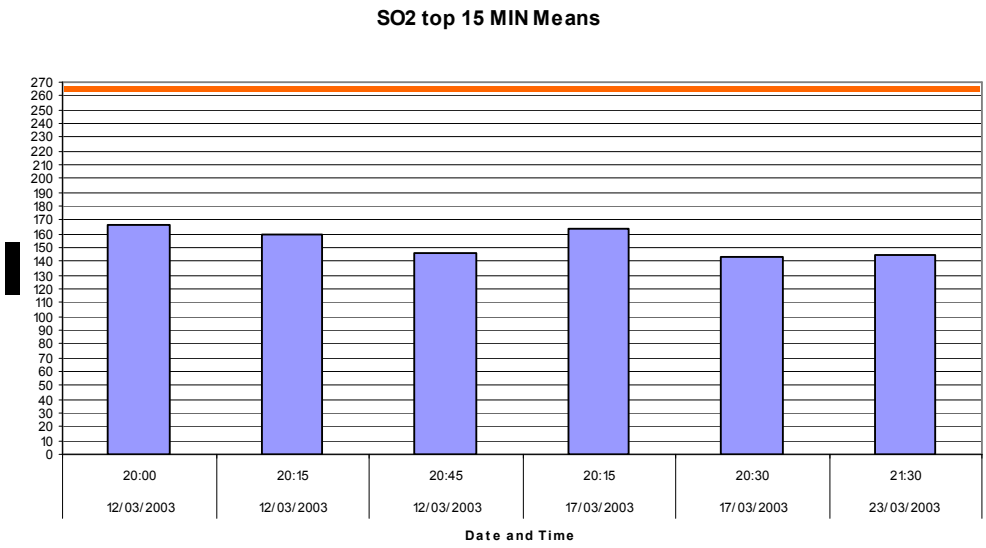


Above are the Monthly uncorrected NO2 readings from the automatic site at Marine Parade Holywood. The Annual Mean Standard is shown in red. It should be noted that two lanes of the A2 through Holywood were closed from May 30 through to mid September for road works. Therefore the results for these months are unlikely to be typical.

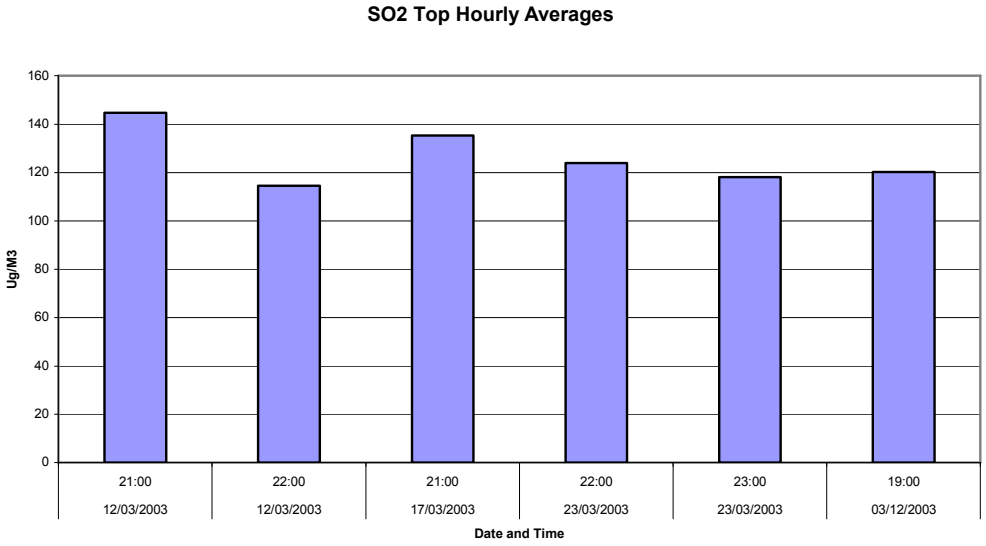


Above are the six highest peak NO2 readings from the automatic site at Marine Parade Holywood. The Hourly Mean Standard not to be exceeded more than 18 times a year is shown in red.

SULPHER DIOXIDE

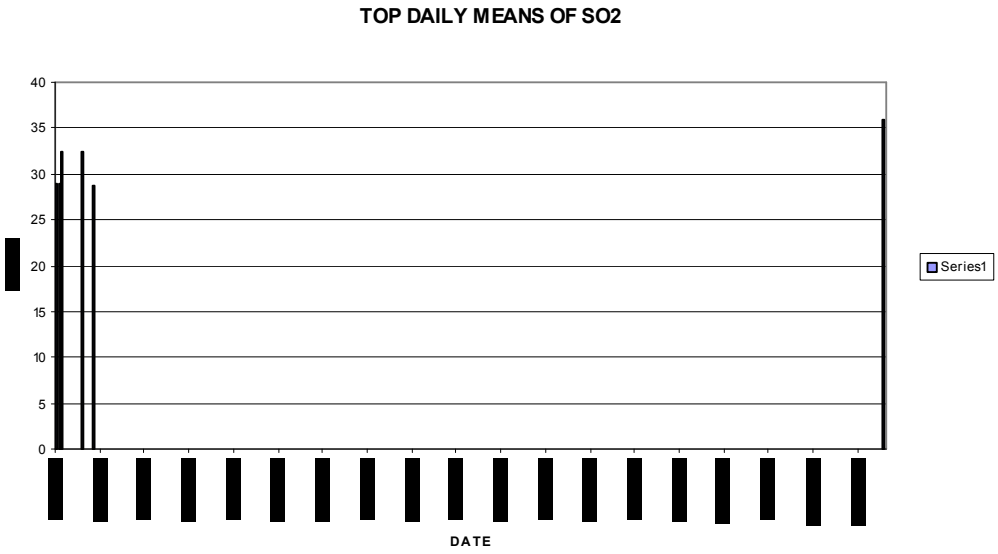


Above is a graph of the top 15Min means recorded at the Church Street/Clandeboye Rd Automatic monitoring site the standard not to be exceeded more than 35 times per year is marked in red.



Above is a graph of the top hourly means recorded at the Church Street/Clandeboye Rd Automatic monitoring site the standard not to be exceeded more than 24 times per year is 350Ug/m3 and as can be seen the measurements are well below this level.

Below is a table of the highest average daily means of SO2 recorded at the Church Street/Clandeboye Rd Automatic monitoring site. It can be seen that they are well below the 125ug/m3 not to be exceeded more than three times per year.

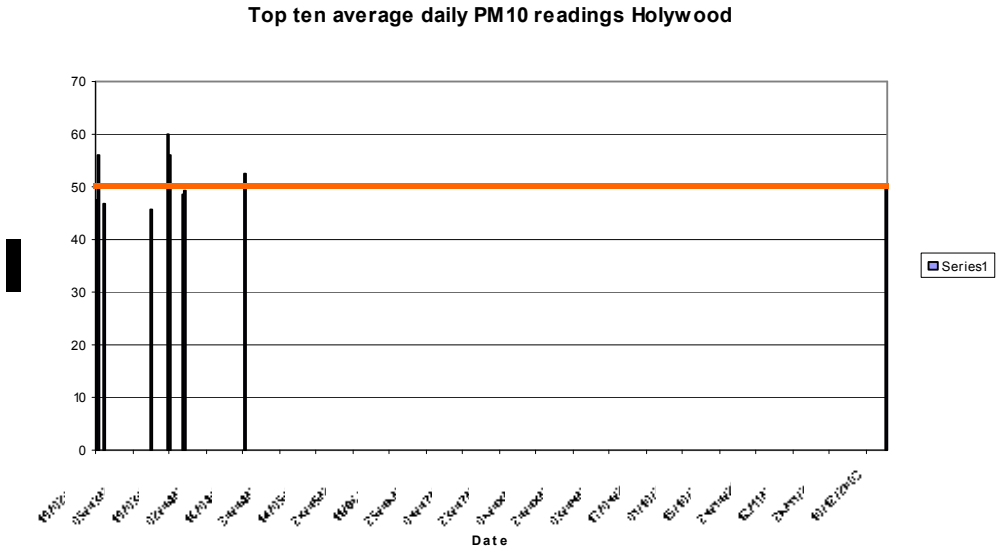

TOP DAILY MEANS OF SO2
40
35
30
25
20
15
10
5
0
DATE
Series1

PARTICULATE PM_{10}

PM_{10} is measured at Marine Parade Holywood, mainly from road sources and near the junction of Church Street/Clandeboye Road to mainly from domestic coal burning. Both sites use Teom equipment. The reading below are uncorrected and are not ratified.

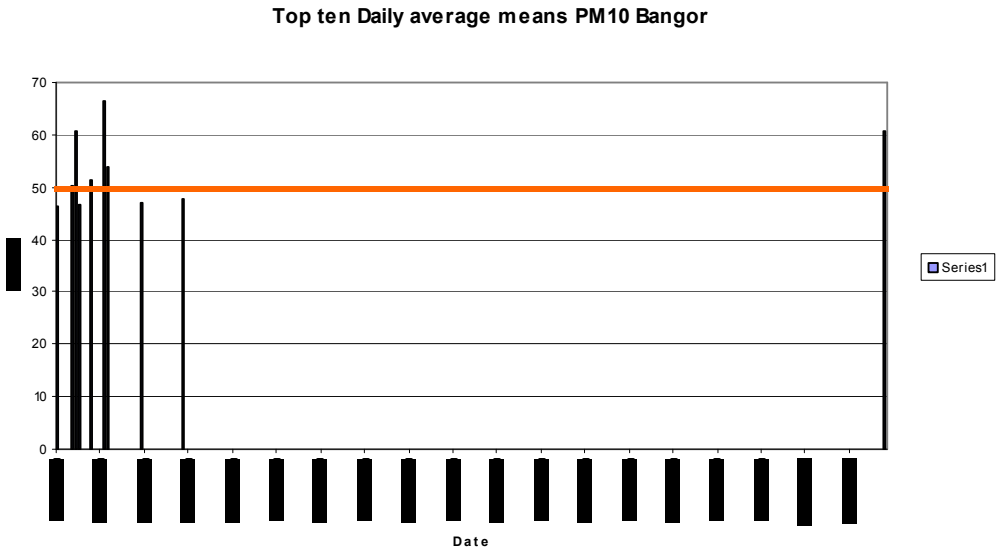
The results are as follows

Holywood A2



There have been four exceedences of the 50ug/m3 limit recorded so far on the uncorrected data.

Bangor Clandeboye Rd Church Street



There have been six exceedences of the 50ug/m3 limit recorded so far on the uncorrected data.

WORK TO BE DONE

It appears from the work carried out so far, that there is a risk that certain areas within North Down Borough Council area may fail to meet the objectives in relation to $PM_{10,}$ at the location were the monitoring is being carried out. The situation in this regard will become clearer as monitoring continues and the results are adjusted and ratified by NETCEN. Work is also ongoing in relation to the emissions database for modeling purposes. This is likely to identify further areas that will require more detailed study via the GIS mapping outputs. Preliminary investigations in this regard show that additional monitoring may be required in the Rathgael road area which is subject to high traffic volumes particularly at peak times and where relevant populations are exposed.

CONCLUSIONS

This report is purely an interim report on the progress so far with regard to $2^{nd}/3^{rd}$ stage review. The results displayed above are provisional and have not been subject to any ratification procedures. When a full years ratified data is produced together with the results of modeling we should be in a position to determine whether or not to declare Air Quality Management Areas.

REFERENCES

Department of the Environment Transport and the Regions (2000) Review and assessment: pollutant specific Guidance LAQM. TG4(00), HMSO. London

Review and assessment: Technical GuidanceLAQM.TG(02)