



Environment Act 1995 Air Quality Review and Assessment Detailed Assessment 2006

May 2007

Detailed Assessment 2006

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Detailed Assessment 2006

Introduction

This report is one of the series of reports required under Part IV of Environment Act 1995. Previous reports have been published and are available to view on Calderdale Council's website. They may also be requested from the Council at the address below.

The Updating and Screening Assessment 2005 (USA) highlighted several areas in Calderdale that were subject to, or possibly were subject to, breaches of air quality standards, and in particular exceedences of the annual mean air quality objective for nitrogen dioxide.

This Detailed Assessment report deals with subsequent investigations in those areas. It covers each area in turn, provides additional monitoring data and any other relevant considerations that have come to light since the USA. Proposed action is outlined and timescales set out.

NOTE: Unless stated otherwise this report refers to investigations and other actions undertaken up to December 2006, although some investigations continue today. All monitoring results are expressed as concentrations in microgrammes of pollutant per cubic metre (μgm^{-3}).

Under Schedule 11 of the Environment Act 1995 and statutory guidance PG(03) this report is made available to the public and other bodies for comment:

The Secretary of State for the Environment

The Environment Agency

The Highways Authority (Calderdale MBC)

Neighbouring Local Authorities:

West Yorkshire- Kirklees MBC and Bradford MBC

Greater Manchester - Rochdale MBC and Oldham MBC

Lancashire- Rossendale BC, Burnley BC and Pendle BC

Calderdale Primary Care Trust

The People of Calderdale.

A copy has been placed on the Calderdale Council web site (www.calderdale.gov.uk) and is also available to view at the offices of Environmental Health Services, given above.

If you wish to comment on this document should do so in writing to the above address, or by email to environmental.health@calderdale.gov.uk before 1 July 2007.

Detailed Assessment 2006

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1 Overview

1.1 Air Quality Objectives

The air quality objectives of concern in Calderdale have been identified as those principally associated with road traffic. Nitrogen dioxide concentrations have been measured at over 100 sites at various times, and particulate matter has been monitored by the mobile air quality monitoring unit at several locations across the Borough. The Council has identified a number of areas where air quality objectives for these pollutants are being, or appear likely to be, breached. Three of these areas have already been declared Air Quality Management Areas (AQMAs). These are at the A629 Salterhebble near Halifax, the A58 Sowerby Bridge and A646 Hebden Bridge. Other AQMAs are likely to be declared in the future.

1.2 Areas identified in the Updating and Screening Assessment 2005

The Updating and Screening Assessment 2005 (USA) included proposed actions to deal with air quality issues affecting parts of Calderdale.

Since that document was written the following action has been taken:

- Calderdale AQMA (No.3) was declared covering the A646 at Hebden Bridge as at September 2006. A Further Assessment report is due Autumn 2007 for this AQMA;
- Calderdale AQMA (No.2) was declared covering the A58 at Sowerby Bridge as at August 2006. A Further Assessment report is due Autumn 2007 for this AQMA;
- Investigations at Copley were completed in April 2006. Two of the five diffusion tubes have been taken over into the Sowerby Bridge study;
- A Further Assessment for the existing Calderdale AQMA (No.1) at Salterhebble Hill, Halifax was completed December 2006. It was subsequently submitted to and approved by DEFRA. An air quality action plan (AQAP) for that AQMA is being constructed and is due for consultation in the Summer 2007.

Possibilities for significant development and redevelopment of Copley Valley are under consideration, and there may well be follow-up investigations to assess their impact on air quality. These will be kept under review.

The USA identified four areas that required more detailed investigation. These were, [with the relevant sections of the USA in square brackets]

1. A646 at Luddendenfoot [Section 4.1.2]
2. Commuter routes close to Brighouse Town Centre [Section 4.1.8]
3. A58 at Stump Cross, Halifax [mentioned in summary]
4. Bull Green roundabout, Halifax [mentioned in summary and Table 4.14]

All four areas are associated with high volumes of traffic and other circumstances that have been seen, in other locations, to increase the likelihood of exceedences of the annual nitrogen dioxide objective.

For each of Stump Cross, Luddendenfoot and Brighthouse the extent of supporting diffusion tube data available at the time of writing the USA was not believed to be robust enough to declare an AQMA.

In the case of Bull Green, Halifax, only DMRB modelling data was available at the time of writing the USA, which in turn suggested that monitoring would be required.

The rest of this report concerns the detailed assessments for each of these areas.

2 A58 at Stump Cross, Halifax

2.1 Introduction

Stump Cross is a small area east of Halifax town centre, at the junction with the A58 Leeds Road and the A6036 Bradford Road. There are a small number of residential properties close to this traffic-light controlled junction where the nitrogen dioxide annual objective appears likely to be breached. The Stump Cross area is shown in Map 2.1

2.2 Additional Monitoring

Initially four diffusion tubes were deployed along the A58, with a fifth added from January 2007. The results are presented in Table 2.1.

Ref	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean	Bias corrected
SC1	52	38	42	21	36	30	36	22	29	37	38	48	36	32
SC2	47	33	42	24	37	26	29		35	68	32	55	39	35
SC3	82	77	86	54	68	75	60	57	67	89	75	52	70	62
SC4	49	31	35	32	33	30	35	25	35	40	41	35	35	31

The results for SC3 show that the annual mean objective is being, or appears likely to be, exceeded at this location. However, the area of exceedence appears to be very small and does not extend far beyond the roadside.

The Groundhog mobile automatic air quality monitoring station was relocated to Stump Cross but did not provide any useful information about nitrogen dioxide concentrations due to problems with contaminated span gas and data logging problems.

PM₁₀ was measured using a TEOM analyser in the Groundhog. The Groundhog is located within 10m of the traffic-light controlled junction, within 3m of the carriageway, where there is frequently standing and slow-moving traffic. The results are presented in Table 2.2.

Period	period mean	period mean x 1.3
15 May 2006 – 31 December 2006	26.2	34.1

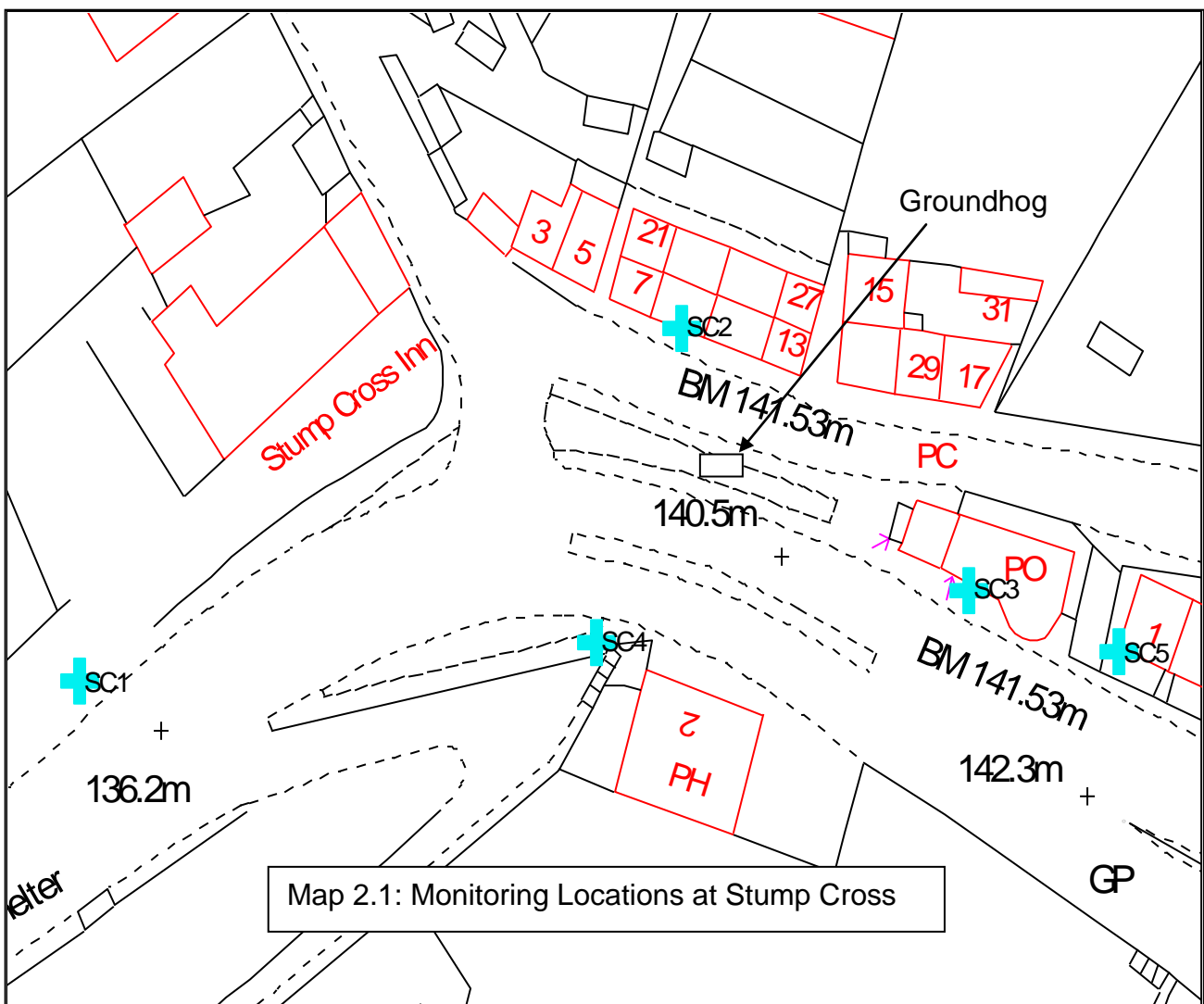
The particulate concentration does not exceed the objective of $40\mu\text{g}\text{m}^{-3}$. This supports modelling carried out using DMRB and presented in the Updating and Screening Assessment for 2005.

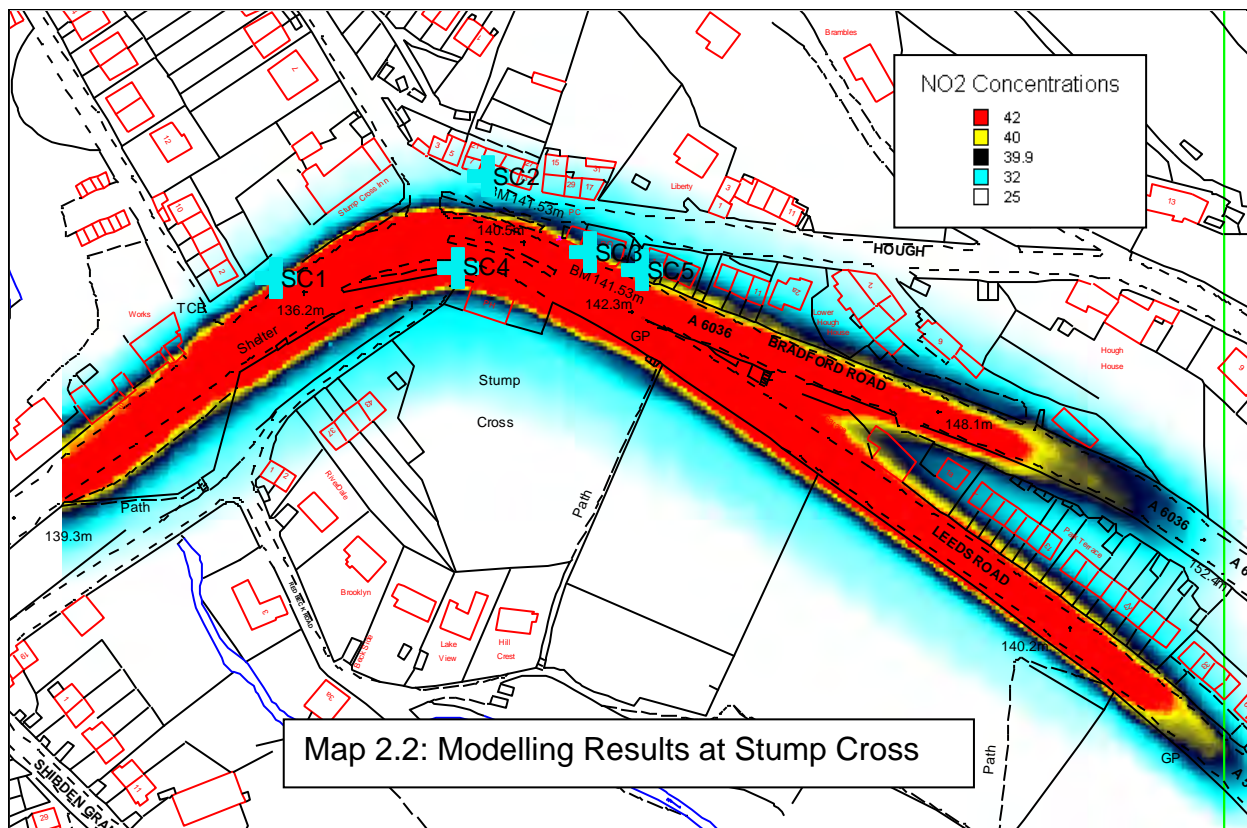
2.3 Modelling with ADMS-Urban

An ADMS-Urban model was produced based on historic traffic data and using weather data from Leeds for the year 2000. The model was refined to obtain reasonable agreement with the diffusion tube data and run to determine the likely extent of the area over which the annual mean objective for nitrogen dioxide is breached.

2.4 Proposed Action and Timescale

The Council has begun the process of declaring an AQMA for nitrogen dioxide, the extent of which will be fairly small. The diffusion tube locations are shown on Map 2.1 and the modelling results are shown in Map 2.1, based on modelling. The aim is to declare in Summer 2007.





Map 2.2: Modelling Results at Stump Cross

The model overestimates the concentrations at SC4 and slightly underestimates at SC3, but otherwise agrees with the diffusion tube results. The houses of Park Terrace, Leeds Road, at the lower right of Map 2.2, are elevated from the road. A new tube, SC5, has been deployed at Park Grove, Bradford Road to determine the nitrogen dioxide concentrations at that row of houses closest to SC3.

3 A646 at Luddendenfoot

3.1 Introduction

The A646 is a busy commuter route between the Upper Calder Valley towns of Hebden Bridge and Todmorden, and Halifax. The section of road through Luddendenfoot passes through a street canyon and traffic is frequently slowed due to traffic controls at the junctions with Luddenden Lane and Station Road. The area is shown in Map 3.1.

A single tube (LF1) has been deployed for several years in the canyon and has consistently shown that nitrogen dioxide levels were close to, and possibly above, the annual objective. The Council was reluctant to consider declaring an AQMA on the evidence of a single tube and further monitoring was organised.

3.2 Additional Monitoring

Six additional diffusion tubes were set up to determine the extent of the affected area and the levels of nitrogen dioxide. There are no suitable

locations for automatic monitoring stations. Provisional results from the diffusion tubes are presented in Table 3.1. Tube LF4 was attached to a house behind a 2m high roadside wall, which may explain the relatively low readings. LF4 was relocated in 2007 to the rear of the 'Coach and Horses' public house.

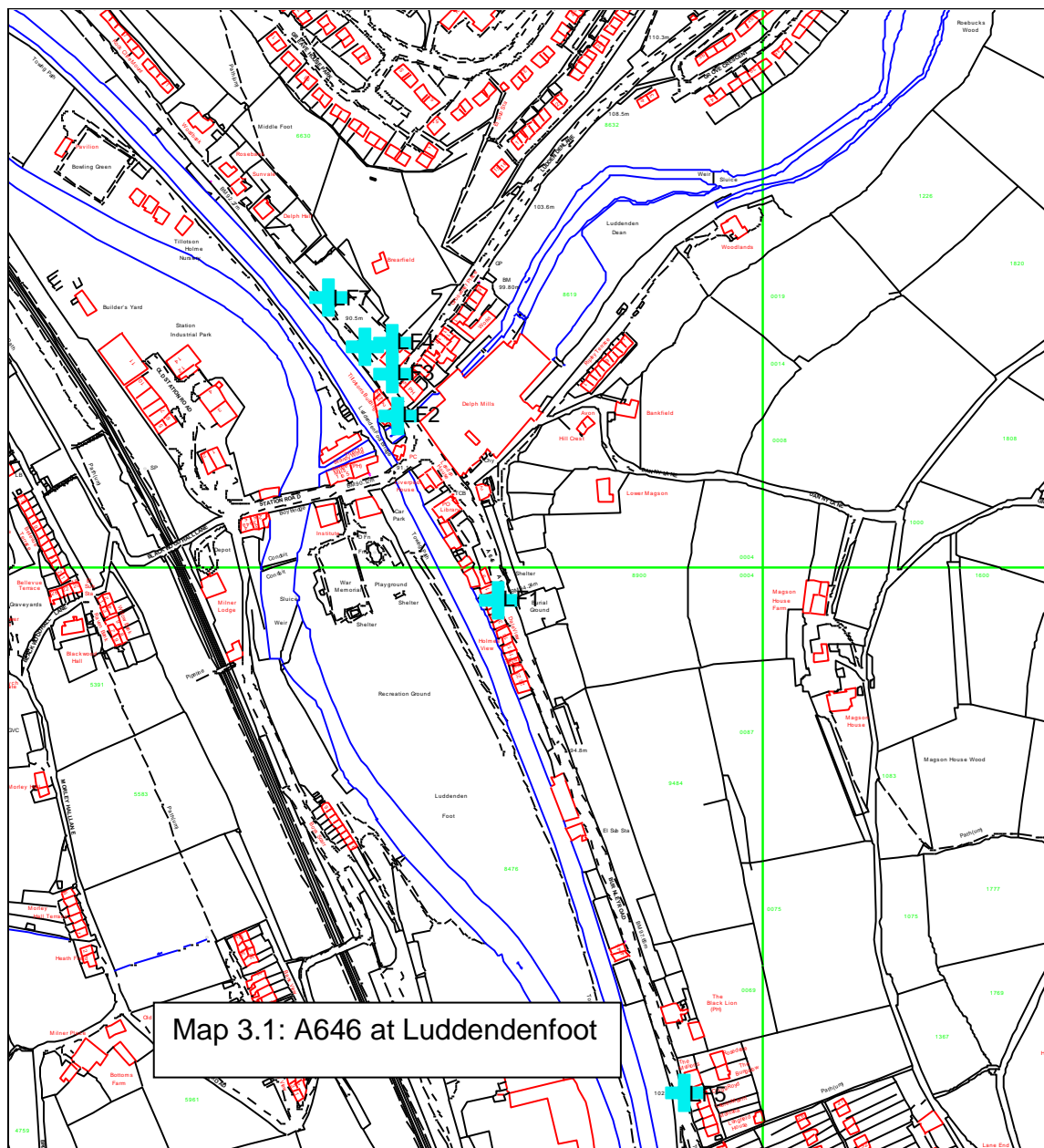


Table 3.1: Diffusion Tube Results for A646 Luddendenfoot 2006, μgm^{-3}

Ref	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	mean	Bias corrected
LF1	64	43	61	48	56	60	60	49	33	63	51	42	53	47
LF2									47	50	51	71	55	49
LF3									42	41	44	45	43	38
LF4									28	28	34	30	30	27
LF5									65	60	43	48	54	48
LF6										42	41	55	46	41
LF7										58	40	71	56	50

3.3 Proposed Action and Timescale

Although only three to four months worth of data is available to supplement the more extensive data of LF1, the Council believes it is likely that the annual mean objective will be exceeded, and it has begun the process of declaring an AQMA for nitrogen dioxide, following the A646 through the canyon, as shown in Map 3.1. The aim is to declare in Summer 2007.

Several planning applications have been received for residential development in this area, including the conversion of the Coach and Horses public house. Tubes LF6 and LF7 have been deployed and LF4 relocated to assess in more detail the average levels of NO₂ in this area and to better define the likely AQMA boundary.

3.4 Period Correction

It is possible to use a period correction factor, as set out in the technical guidance TG03, to adjust for the short monitoring period, but examination of the means shows that the factor would have to be very small to have any impact on the conclusion.

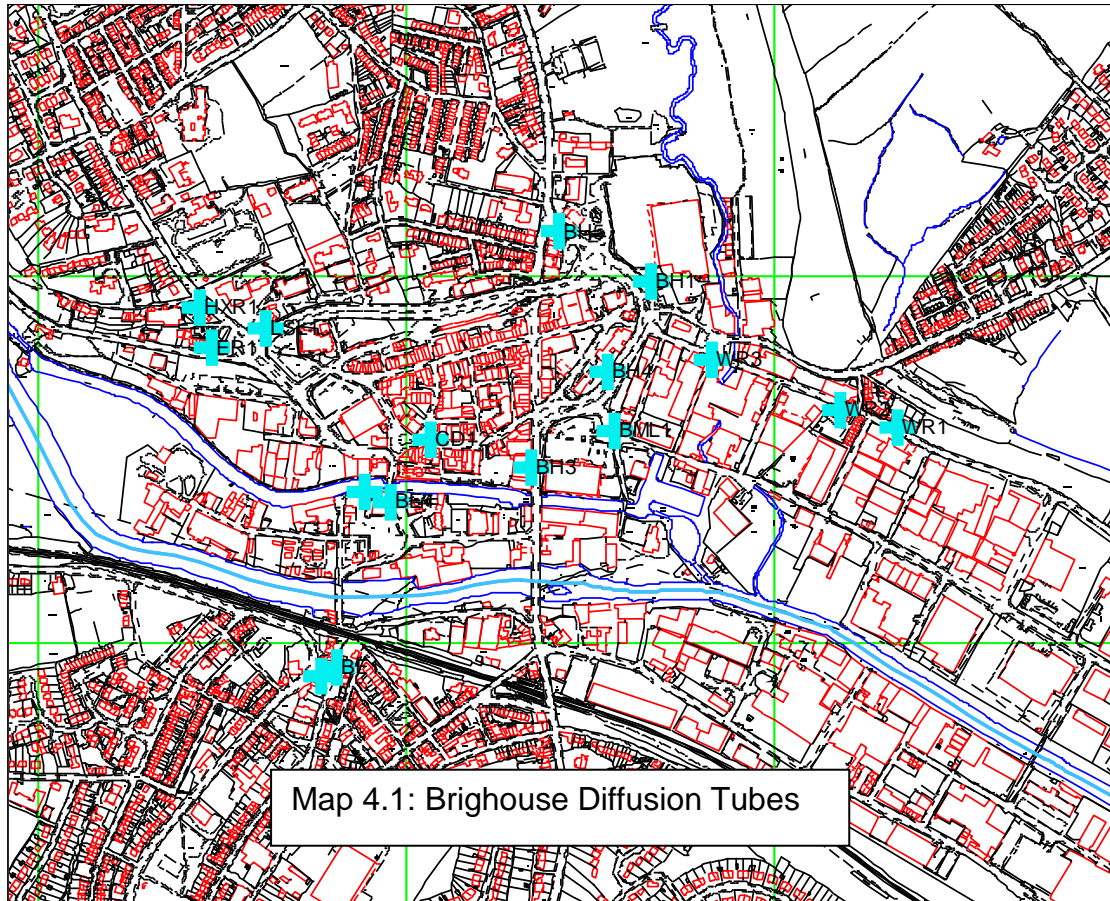
4 Brighouse

4.1 Introduction

Brighouse town centre is the most complex area to assess for traffic related air quality. The A6025, A641, A643, and A644 pass through and around the town and the traffic controls and volumes can lead to standing and slow moving traffic. Five diffusion tubes placed along the major routes early in 2006 indicated that the mean annual concentrations of nitrogen dioxide were generally higher than the objective, but the location of these tubes, in particular the lack of nearby receptors, lead the Council to believe that more data would be required before making a decision on declaring an AQMA.

4.2 Additional Monitoring

Thirteen diffusion tubes are currently deployed in Brighouse, see Map 4.1 below. Three of the five tubes originally deployed have been moved closer to relevant receptors, and additional tubes have been deployed to cover other receptors. The results from the diffusion tubes are presented in Table 4.1 and show that almost all the locations represented are likely to exceed the annual air quality objective for nitrogen dioxide. The one exception, BE3, is situated away from the major roads and serves as a local background site.



Map 4.1: Brighouse Diffusion Tubes

Table 4.1: Diffusion Tube Results, Brighouse 2006, $\mu\text{g m}^{-3}$														
Ref	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	mean	Bias corrected
BH3	72	66	57	49	75	51	43	43	52	65	62	54	57	51
BH5	54	62	44	53	61	46	39	46		68	59	59	54	48
BE1									61	56	37	37	48	42
BE2									71	70	55	65	65	58
BE3									33	36	29	34	33	29
BE4									73	62	49	60	61	54
ER1									57	50	45	41	48	43
HXR1									64	64	62	44	59	52
LSL1									70	70	62	53	64	57
WR2									54	61	61	54	58	51
WR3									43	59	48	47	49	44
WR1	79	49	69	52	56	44	47	47	57	64	62	56	57	51

4.3 Likely Extent of AQMA

The Council is considering how best to approach the declaration of an AQMA for Brighouse Town Centre. In the context of the Urban Development Plan, adopted August 2006, the town centre includes existing residential development, retail development (which by definition can include residential accommodation appropriate for a town centre location, eg residential above

shop premises) and land set aside for future 'mixed use' development, which again can include residential accommodation of one sort or another.

Modelling is not considered appropriate due to the complicated road system and traffic flows around Brighthouse, and the substantial changes likely were the land earmarked for mixed use development put to residential use.

The Council intends to declare an AQMA in Summer 2007 but as yet no firm decision has been taken on a boundary. One option will be to declare the whole town centre area, including the retail and mixed-use areas as an AQMA. Another option is to declare a corridor of land along on existing major communication routes and likely future roads, and taking into account critical receptors, and monitoring locations. This second option would effectively leave a small area in the very centre of the town centre outside the AQMA.

5 Bull Green, Halifax

Introduction

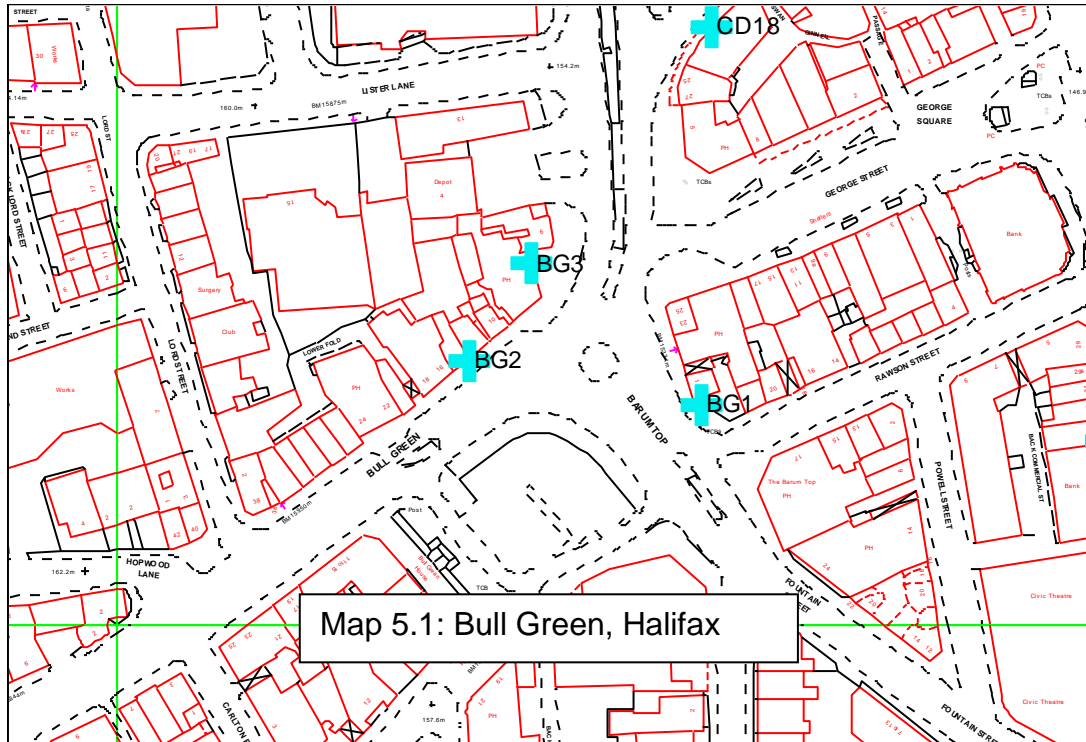
Bull Green is centred on a major roundabout close to Halifax town centre. The roundabout controls traffic coming into the town centre as well as a high volume of through traffic. There are few receptors, mainly residential units located over commercial properties, In the USA DMRB modelling and knowledge of the local traffic flows indicated that some monitoring was required.

5.2 Additional Monitoring

Three diffusion tubes have been deployed around Bull Green since Autumn 2006, (Tube CD18 was discontinued in September 2005). Locations are as shown in Map 5.1.

Initial monitoring results are given in Table 5.1. They suggest that the annual mean objective is likely to be exceeded, but the complexity of traffic flows, lack of detailed information about receptor location, and the desirability for further monitoring data supports a need for further investigation at Bull Green.

ref	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean	Bias corrected
BG1									47	52	44	49	48	52
BG2									53	60	55	51	55	61
BG3									64	58	57	56	59	66



6 Modelling

The Council has used modelling in the past to determine the likely extent of AQMAs. The results have not always been convincing, or ultimately supported by the monitoring data, and modelling of all the areas covered in this report is not considered appropriate. The reasons for this are

- There is reliable monitoring data for each area
- Some modelling has been carried out for Luddendenfoot, the simplest area to model, as reported in the Updating and Screening Assessment 2005
- Brighouse and Bull Green in particular exhibit complex traffic flows with multiple traffic controls and sparse distributions of receptors
- Stump Cross has been modelled for this report and using DMRB (for particulates, reported in the Updating and Screening Assessment 2005) and this agrees well with the continuous monitoring (TEOM) data.

7 Quality Control and Quality Assurance

The Council continues to use West Yorkshire Analytical Services for diffusion tube surveys. Tubes are prepared using 50% TEA in acetone and are deployed by employees with the appropriate training in accordance with the technical guidance. Deployment and recovery dates and times are recorded for laboratory use. Results are supplied in paper form and are transferred to

the Council's computer network for analysis. The raw results are preserved to guard against data corruption.

The Council maintains records of dates of initial deployment, relocation or removal of diffusion tubes together with reasons. A digital map of locations is also kept up to date.

Diffusion tubes results are normally averaged over a 12-month period beginning in January and ending in December of the year in question. Where a shorter period is used the results may be period corrected using the method set out in the technical guidance.

The variability in the response of the diffusion tubes is allowed for by assuming a constant bias for all the tubes deployed in Calderdale over the year, and bias correcting using the results from three diffusion tubes co-located with the continuous analyser Romon 2. The Council has submitted its own results for inclusion in the regional bias correction survey and intends to use the factor from that survey in the final analysis of the diffusion tube results.

Important Note The Council has used a factor of 0.89 when bias correcting annual means for this report. This factor comes from the Netcen spreadsheet presented in Appendix 1. The co-location study at the Groundhog has been abandoned this year (see comments in Section 2.2).

9 Forthcoming Reports

The Council expects to produce further reports as follows:

- Draft Air Quality Action Plan for AQMA No 1, Salterhebble, due Summer 2007
- Further Assessments for AQMA No 2 at Sowerby Bridge and AQMA No 3 at Hebden Bridge, due in August and September 2007, respectively;
- Progress Report for 2007, due April 2008
- Draft Air Quality Action Plans for AQMA No 2 at Sowerby Bridge and AQMA No 3 at Hebden Bridge, due Spring 2008
- Further Assessments for AQMAs to be declared for Luddendenfoot, Stump Cross and Brighouse by Summer 2008;
- Updating and Screening Assessment 2008, due April 2009.
- Draft Air Quality Action Plans for AQMAs at Luddendenfoot, Stump Cross and Brighouse by December 2008

Appendix 1: Calculation of a bias correction factor for 2006

The Netcen spreadsheet (replicated below) was used to calculate a bias correction factor of 0.89 for the diffusion tube results in this report.

Analysed By ¹	Method	Year ⁵	Site Type	Local Authority	Length of Study (months)	Diffusion Tube Mean Conc. (Dm) ($\mu\text{g}/\text{m}^3$)	Automatic Monitor Mean Conc. (Cm) ($\mu\text{g}/\text{m}^3$)	Bias (B)	Tube Precision ⁶	Bias Adjustment Factor (A) (Cm/Dm)
WYAS	50% TEA in Acetone	2006	R	Calderdale MBC	10	61	68	-9.6%	P	1.11
WYAS	50% TEA in Acetone	2006	UC	Leeds CC	11	47	37	27.3%	G	0.79
WYAS	50% TEA in Acetone	2006	UB	Wakefield MDC	10	31	28	11.2%	S	0.90
WYAS	50% TEA in Acetone	2006	UB	Wakefield MDC	12	32	26	19.7%	G	0.84
WYAS	50% TEA in Acetone	2006	K	Wakefield MDC	12	57	54	6.1%	P	0.94
WYAS	50% TEA in Acetone	2006	UC	Wakefield MDC	9	49	36	37.6%	G	0.73
WYAS	50% TEA in Acetone	2006	UB	Wakefield MDC	12	32	28	13.3%	G	0.88
WYAS	50% TEA in Acetone	2006	UB	Leeds CC	11	33	31	7.3%	G	0.93
WYAS	50% TEA in Acetone	2006	UB	Leeds CC	11	44	41	6.9%	G	0.94
WYAS	50% TEA in Acetone	2006		Overall factor (9 studies)					Use	0.89

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