Calderdale Council

Environment Act 1995

Calderdale Air Quality Management Area (No 4)

Luddendenfoot Further Assessment Report

July 2009

A Plain Language Guide to the Report

In 2007 Calderdale declared part of Luddendenfoot as an **Air Quality Management Area** (**AQMA**) due to the levels of **nitrogen dioxide**, which has the chemical symbol **NO_2**. This brief guide gives a simple explanation of the contents of the report and some of terms used. It is not intended to replace a reading of the report itself.

Justifying the AQMA- Measurement and Modelling of Nitrogen Dioxide

Section 2 of the report examines why the AQMA was necessary by reviewing the monitoring data and discussing a possible change in the AQMA boundary.

What are the likely levels of Nitrogen Dioxide in the future?

Nitrogen and oxygen exist naturally in the air we breathe. Burning fossil fuels (eg petrol and diesel in vehicles) in air allows the nitrogen to combine with oxygen to produce gases called **nitrogen oxides** (**NOx**). Complicated chemical reactions convert the NOx to **nitrogen dioxide** (**NO_2**). The European Union required the UK Government to achieve certain **air quality objectives** (**AQOs**). It expected the UK to have reduced NO_2 pollution to acceptable levels by 2010. The UK Government recognised that the country would not have achieved this. It is presently in negotiation with the EU to extend the time for compliance. In the meantime the UK is continuing to try to bring about compliance.

Section 4 discusses **background levels** of NO_2. These are the levels from local industrial activity and distant traffic that would exist were the local traffic not there. Knowing the background levels today allows an assessment of the amount of pollution being caused by the A646 traffic today, and is used to predict future levels.

One diffusion tube in Luddendenfoot has consistently recorded levels of NO_2 above the air quality objective. Section 5 considers the reasons for this, and further monitoring is discussed.

Other Considerations for an Action Plan

This report will be used as the basis for an **Air Quality Action Plan** (**AQAP**) of measures to try to achieve more acceptable levels of NO_2. An AQAP is not just about reducing the pollution itself. Reducing exposure to pollution and avoiding situations that prevent the dispersion of pollution is also important. Section 5 discusses local commuting and recent planning development, and how local and national policy might contribute to better air quality in Luddendenfoot.

If you have any questions about this report, please do not hesitate to contact Environmental Health, Housing and Environmental Services.

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Precautionary Note

This report, dated July 2009, was commenced in 2008. It relies on information and guidance available at that time. Publication was delayed for various reasons until 2010.

In late 2009 Calderdale commenced working with Leeds University Institute for Transport Studies, to better understand the issues involved in NO_2 generation. One project on the A646 at Hebden Bridge (west of Luddendenfoot) measured vehicle NOx emissions as they drove by. In March 2010 final reports were awaited. Early indications are that the age and composition of the vehicle fleet is different to that assumed by this report, and that individual vehicle emissions are largely compliant with Government/ manufacturers requirements. Clearly this affects the projections in this report and impacts upon the credible measures that can be brought about by this Council to reduce NO_2 in the AQMA.

Full implications will be known later in 2010, to be considered as part of a revised AQAP

1. Introduction

An Air Quality Management Area (AQMA) covering the A646 corridor in Luddendenfoot came into effect on 1st August 2007.

The AQMA was designated under Section 83 Environment Act 1995. The annual mean air quality objective (AQO) for Nitrogen Dioxide (NO_2) specified in the Air Quality (England) Regulations 2000 is 40μg/m^3. The designation was in part due to a known exceedence of the AQO and in part due to modelled evidence of a likely exceedence of the AQO.

Section 84(2) of the Act now requires further assessment of the AQMA. This further Assessment addresses the following issues

- Confirmation of the original assessment of air quality (Sections 2.1 and 2.2)
- Review of the existing AQMA boundary (Section 2.3)
- Review of Comments made by Statutory Consultees (Section 3)
- Calculation of the extent of improvement in air quality needed (Section 4)
- The impact of recent policy developments upon the AQMA (Section 5)

2 Confirmation of the original assessment of air quality

Essentially this comprises

- a review of the information available leading up to declaration of the AQMA
- assessment of information available post-declaration

2.1 Review of information available leading up to declaration of the AQMA

Luddendenfoot is a small village with residential property fronting the A646, which carries in some 16,000 vehicles / day. Investigations commenced with the deployment of a single passive diffusion tube (ref LF1) in March 2003. The 2004/05 Detailed Assessment concluded that the air quality objective would not be exceeded. The 2005 annual average NO_2 derived from LF1 was 41μg/m^3. Modelling had predicted a lower level of 36-38 μg/m^3, as suggested by the green shading on the map at Figure 1 below, relying on 1-4% reduction in the annual average daily traffic flow (AADT) between 2003 and 2005 along this stretch of the A646. That prediction was supported by a 12-month mean of the tube results for the period November 2004-October 2005 of 38μg/m^3.

The A646 corridor was modelled using ADMS Urban 2.2 with MapInfo as the visualisation tool, and weather and traffic data inputs to compute pollutant concentrations and distribution.

There is always concern about the accuracy of modelling outputs, which arise from

- The use of regional weather data compared to actual local weather. Calderdale held weather data sets for Leeds 2000, and for Bingley 2001-2005. These weather stations lie 32km and 15km east and northeast respectively of Luddendenfoot. Datasets include data for cloud cover which is used to estimate solar radiation and hence the heating of the air at ground level. Together with wind data they permit modelling of the distribution of pollution over the area. Cloud cover is determined at RAF Leeming 70km to the north-northeast.

- How representative modelling is of actual topography, buildings and traffic data since Burnley Road presents a typical street canyon with tall terraced buildings separated from the highway by narrow pavements; that there are two junctions at the A646 with Luddenden Lane and later with Station Road; and whether traffic data accurately accounts for these junctions, peak time congestion, variable traffic speeds and fleet composition. The council held some 2004 and 2005 data, primarily Annual Average Daily Traffic (AADT) two-way 24-hour flows, coupled with a limited breakdown of the use-class gained from visual surveys in separate peak hour flows. Since declaration some 2007 data has become available.
- How accurately modelling predicts production of NO_2 from NOx

Other than LF1 no other data was available to help determine if the area was likely to exceed the AQO for nitrogen dioxide. The 2005 Updating and Screening Assessment supported further investigation but not the declaration of an AQMA at that time. The Progress Report 2005 reported an annual average for LF1 of only 33$\mu g/m^3$ [and a separate figure of 35 $\mu g/m^3$ for the period July 2005-June 2005]. It also noted new residential building (ie new receptors) underway on a former industrial site in Luddendenfoot. The general close proximity of buildings to the A646 offered little opportunity to locate a continuous monitor in the village, and hence the stated intention was to deploy further diffusion tubes during 2006 and thereafter. The Detailed Assessment 2006 reported the deployment of six additional diffusion tubes (LF2-LF7) with effect from September / October 2006. LF6 and LF7 were located in response to an envisaged redevelopment of the Coach and Horses public house to residential use. Following initial low readings LF4 was subsequently relocated from its position on a house facade behind a 2m high roadside wall to the rear of the 'Coach and Horses' public house.

The measured results of LF1-7 are given in Table 1 below, and the position of the tubes and the outcome of the modelling are depicted in Figures 1 and 2 below.

Table 1: Diffusion Tube Results (Bias-corrected) 2003-2006 in $\mu g/m^3$

Ref	Location	2003	2004	2005	2006
LF1	Burnley Road	40^	33&	41$	47
LF2	Tillotson Buildings				49*
LF3	junction of Luddenden Lane with Burnley Road				38*
LF4	(initial location) Mill Stream Drive				27*
LF5	adjacent to 'The Mullions' Burnley Road				48*
LF6	Burnley Road-'Coach & Horses' PH car park				41#
LF7	Burnley Road-'Coach & Horses' PH car park				50#

Notes to Table 1
^ based on 10 results, as reported in the Detailed Assessment (interim and final reports) 2004-2005
$ as reported in the Updating and Screening Assessment 2005
& as reported in the Progress Report 2005
* based on 4 months exposure September – December 2006
# based on 3 months exposure October – December 2006

In the case of the short-term exposures it would be 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 derived from the few months of monitoring undertaken shows that the factor would have to be very small to have any impact on the conclusion.

Reference to the data from 5 continuous monitors across Calderdale did not support the likelihood of exceedence of the 200 $\mu g/m^3$ hourly AQO at Luddendenfoot.

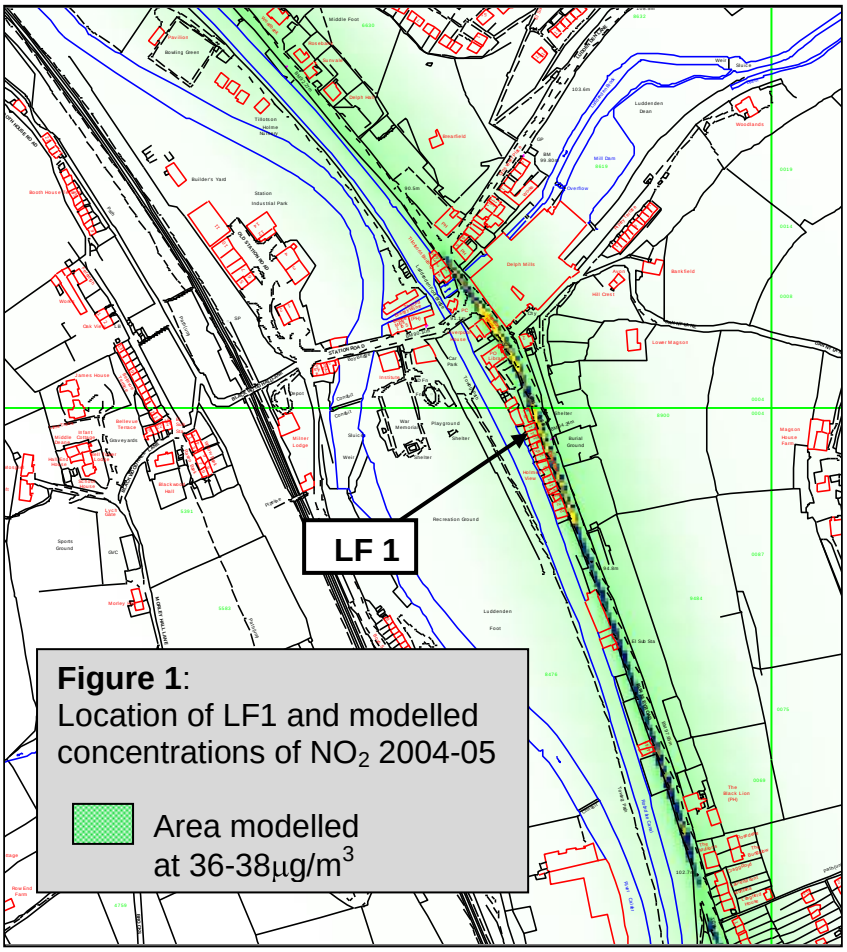


Figure 1:
Location of LF1 and modelled concentrations of NO_2 2004-05

Area modelled at 36-38μg/m^3

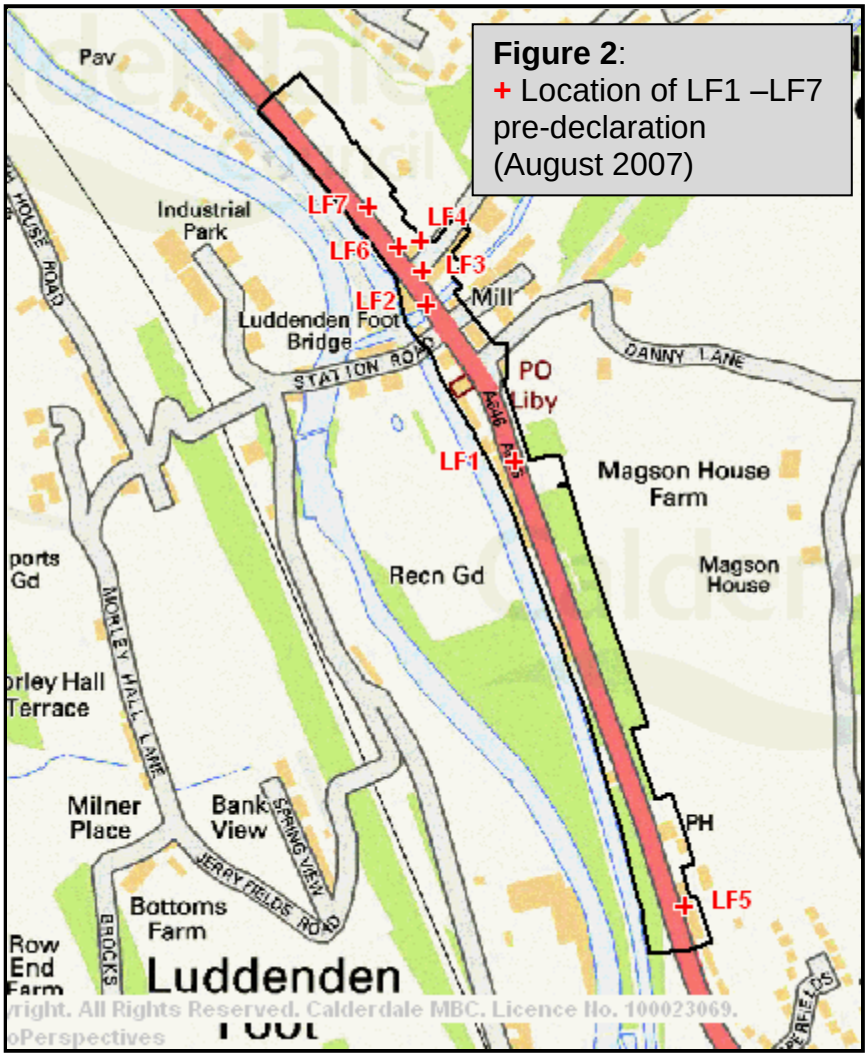


Figure 2:
+ Location of LF1 –LF7 pre-declaration (August 2007)

Statutory Guidance LAQM.PG(03) promoted the inclusion of areas of modelled poor air quality within the AQMA, but not to sub-dividing blocks of terraced residential property, nor to separating houses from their gardens. An AQMA covering the A646 corridor took effect 1st August 2007 and the boundary is portrayed in Figures 2 and 3.

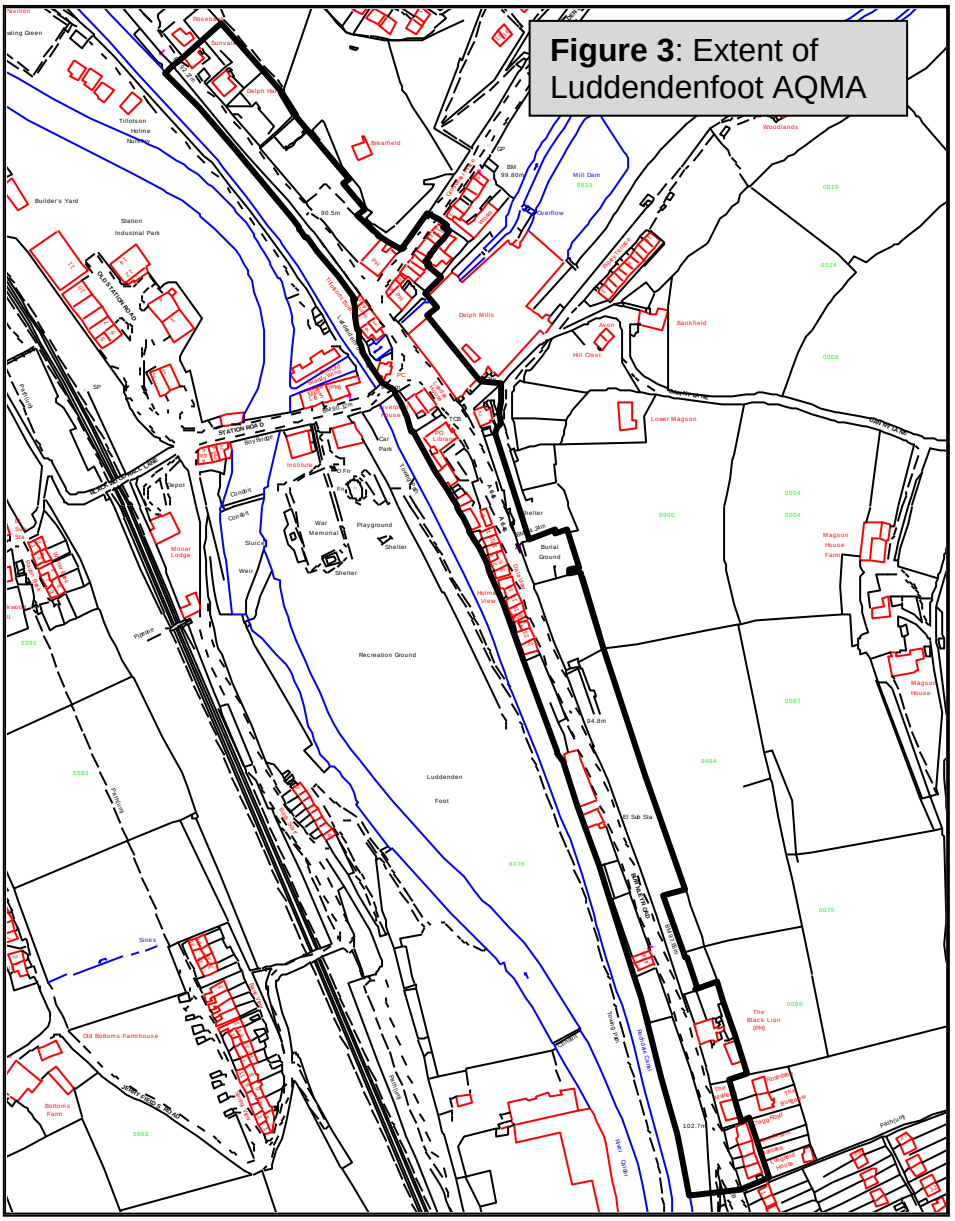


Figure 3: Extent of Luddendenfoot AQMA

2.2 Assessment of information available post-declaration

Some changes were made to the deployment of tubes in 2007. Tube LF4 was discontinued and relocated to the rear of the Coach and Horses public house (see Figure 2 above). Tubes LF6 and LF7 which had been positioned to help determine a possible planning application for residential development were discontinued. Tube LF5 which had been subjected to repeated interference was relocated nearby and renamed LF8.

Monitoring data for the whole of 2007 was summarised in the Progress Report 2007 and is given in Table 2 below.

Table 2: Diffusion Tube Results (Bias and Period -corrected) 2007 and 2008 in μg/m^3					
Ref	Location	Data available (Months)* 2007	Mean 2007		Mean 2008
LF1	Burnley Road	11	54		50
LF2	Tillotson's Buildings	11	43		38
LF3	junction Luddenden Lane / Burnley Rd	11	36		33
LF4	(initial location) Mill Stream Drive	1	28#	Jan 2007 only	-
LF4	(second-location) r/o 'Coach & Horses' PH Burnley Rd	10	25	From Feb 2007	23
LF5	adjacent to 'The Mullions' Burnley Rd	7	37	Based on results for Jan, Feb, Jun, Jul, Aug, Oct & Nov 07, then discontinued	-
LF6	Burnley Rd-'Coach & Horses' PH car park	6	35	Deployed Jan to June 2007	-
LF7	Burnley Rd-'Coach & Horses' PH car park	6	39	Deployed Jan to June 2007	-
LF8	Burnley Road	1	34#	commenced December 2007	33

Notes to Table 2
*All results for September 2007 are missing due to an error at the analysing laboratory.
Bias correction factor 0.9 and Period Correction factor of 1.0 applied for 2007 data, bias correction factor of 0.8 applied to 2008 data.
Only 1 month of monitoring at these locations. Value quoted is **raw uncorrected** data.

2.3 Re-consideration of the AQMA boundary

Part of the AQMA boundary was determined by modelling. The diffusion tubes were then placed at points of relevant exposure and initial monitoring data showed levels of NO_2 in excess of, or close to, the annual mean air quality objective at most of the tube locations. The relocation of LF4 and LF5 (renamed LF8) is discussed above. It is likely, based on monitoring data since declaration of the AQMA, that the boundary will be revised.

3 Review of Comments made by statutory consultees

The intention to declare the A646 at Luddendenfoot was featured in the Detailed Assessment 2006. Subsequent investigations at Luddendenfoot are also featured in the Progress Report 2007, published April 2008. Of the consultees DEFRA has responded in relation to the content of those reports.

4 Calculation of the extent of improvement in air quality needed

This section considers

- determination of a background concentration of NO_2 for Luddendenfoot for 2008 and projection to 2010
- consideration of possible sources of nitrogen dioxide in Luddendenfoot
- establishing local traffic data source apportionment and model projections for 2008 and 2010

4.1 Background NO_2 concentration

Luddendenfoot lies in the Calder valley, here orientated northwest-southeast. The predominant wind direction is along the valley with overlying westerly winds.

Normally to derive a background NO_2 concentration for the AQMA data is sought from a representative location, albeit not within or near to the AQMA or other significant sources, eg roads or industry. As no such data exists for Luddendenfoot the Council used the estimated values published on the National Atmospheric Emissions Inventory (NAEI) in August 2007 (www.airquality.co.uk/archive/laqm/tools/43_2004.csv). The NAEI offers data for four grid references close to the AQMA in Figure 4 below. These are at various elevations above the valley floor with grid reference 403,500 425,500 being closest to the A646.

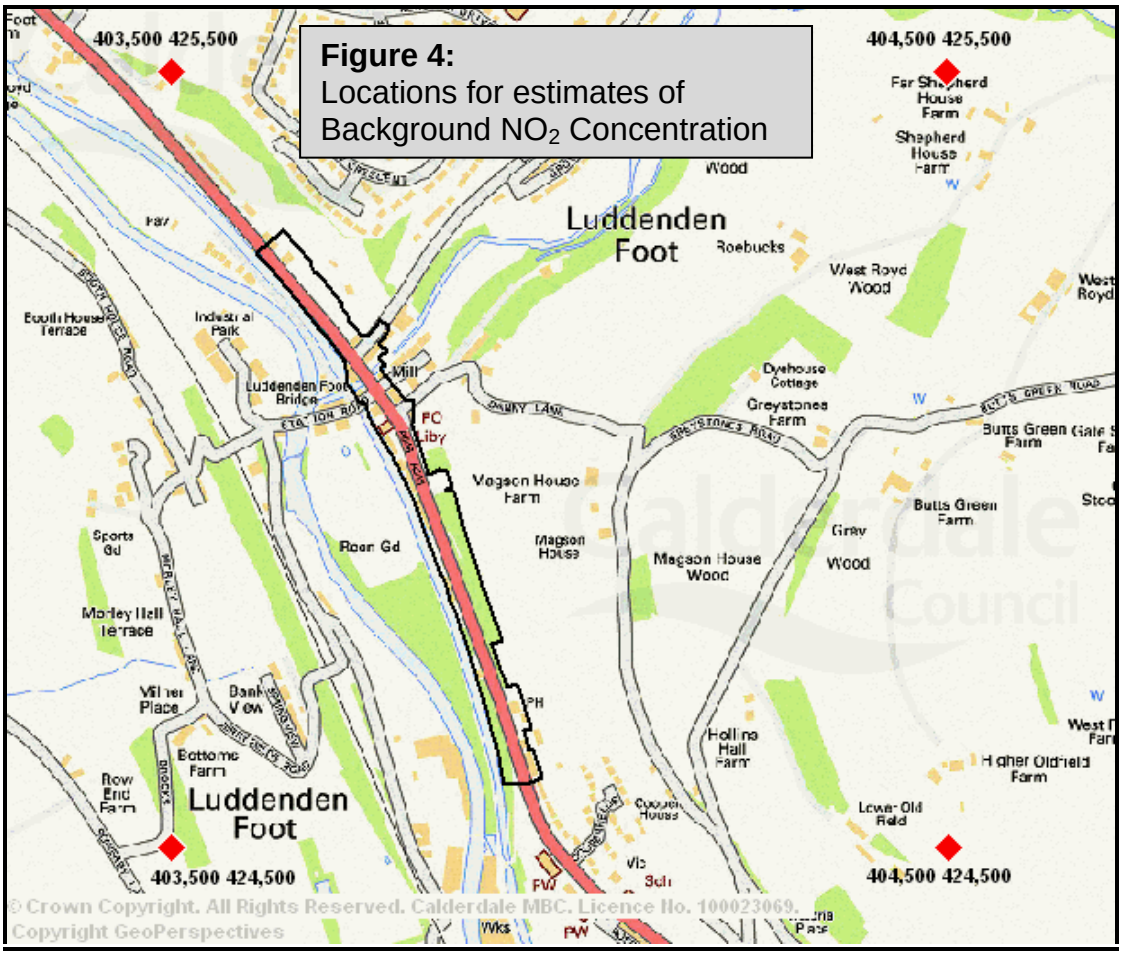


Figure 4:
Locations for estimates of Background NO_2 Concentration

Values for 2010 were projected using the method of Box 2.1 of [TG09].

Table 3: Ambient NO_2 (and NOx) concentrations [μg/m^3] for 2005, with projections to 2007 and 2010							
Location	**Type**	**2005***	**Projection method to year**				
			NAEI 2007#	**UKA-YAC 2007$**	**NAEI 2010***	**NAEI 2010#**	**UKA-YAC 2010$**
NGR 403500, 424500 (south of Bottoms Farm, Brocks)	rural background	12.6 (16.1)	11.9 (14.8)	12.0 (14.9)	10.2 (13.0)	10.8 (12.9)	11.0 (13.0)
NGR 403500, 425500 (hillside above Rock Cliffe, Burnley Road)	rural background	12.5 (15.9)	11.8 (14.6)	12.0 (14.7)	10.0 (12.8)	10.7 (12.7)	10.9 (12.8)
NGR 404500, 424500 (east of Lower Oldfield, Warley Wood Lane)	rural background	15.3 (18.4)	14.5 (16.9)	14.6 (17.0)	11.6 (14.8)	13.1 (14.7)	13.4 (14.8)
NGR 404500, 425500 (nw of Far Shepherd Hs Farm, Halifax Lane)	rural background	13.2 (16.8)	12.5 (15.5)	12.6 (15.5)	10.6 (13.5)	11.3 (13.4)	11.5 (13.5)

Notes to Table 3
* 2005 data and 2010 projection derived from NAEI UK air quality archive (www.airquality.co.uk/archive/laqm/tools/43_2004.csv).
# based on 2005 NAEI estimate. Projected to 2007 and 2010 using Box 6.7 and Box 6.8 LAQM.TG(03)
$ based on 2005 NAEI estimate. Projected to 2007 and 2010 using the UK archive year adjustment calculator [www.airquality.co.uk/archive/laqm/tools/Year_Adjustment_Calculator22a.xls] with 2005 as the base year

Estimates for NGR 403500, 425500, east of Lower Oldfield, represents the highest background levels in the locality. Our experience is that NAEI data tends to under-estimate actual background concentrations but in the absence of measured data it is all that is available. Thereafter projections using the year adjustment calculator offer the least conservative predictions. Therefore we have assumed the following background levels

- for 2008: 13.4 μg/m^3 of NO_2 and 17.4μg/m^3 of NOx
- for 2010: 12.3 μg/m^3 of NO_2 and 15.9μg/m^3 of NOx

4.2 Non-traffic sources of nitrogen dioxide

The AQMA lies in the Calder valley. The predominant wind direction along the valley floor here is northwest to southeast, but the overlying wind direction is from the west. Paragraph 6.05 LAQM.TG(03) holds that the main sources of NOx are transport and electricity generation, and clearly fossil fuel combustion will supplement that, but there is little if any local industrial operation involving power generation. What emissions there may be are assumed to dissipate quickly to the south and ultimately to the east.

The topography of Luddendenfoot is such that tall buildings and embankments line both sides of the A646. The Leeds-Halifax -Manchester / Blackpool / Preston railway also lies in the valley, just outside the AQMA but it is lightly trafficked and there is no rail halt at Luddendenfoot. [Paragraph 6.50 of LAQM.TG(03) suggests the rail traffic would be a significant local contributor to NO_2]. There is also the Rochdale canal, solely used by low levels of leisure traffic. It is not considered to be a major contributor to local NO_2 levels.

Development in the AQMA is mainly residential, with limited off street car-parking, and a few retail premises and public houses. Dwellings off Mill Stream Drive may be partly shielded from A646 traffic fumes by a solid stone garden wall, as suggested by the results of LF4 prior to February 2007. Mill Stream Drive was formerly an industrial mill site. Boiler emissions dissipating to the southeast may have influenced the estimate for NGR 404500, 424500 in Table 3 above.

Outside the AQMA and to the west off Station Road and Ellen Holme Road are three motor engineering operations, a small furniture manufacturer, a tyre shop, a plant hire depot, a large caravan storage facility, a scrap yard, an auctioneer and a small steel fabricator. Off Ellen Holme Lane is an engine seal manufacturer (not a permitted process under the Environmental Permitting Regulations 2007). There is a dormant waste transfer station off Stoney Lane. Tenterfields Industrial Estate, 500m to the south and downwind, has light industrial units including a garage and a printer but no significant power generation installation such as might contribute directly to local NO_x levels. Elsewhere small primary schools to the north-east and south both have small boiler-houses.

It is more likely that the main source of nitrogen dioxide in this AQMA is from traffic using A646 and its minor contributory roads of Station Road and Luddenden Lane.

4.3 Road traffic contribution

The following calculation of source apportionment at Luddendenfoot follows the method set out in Box 7.1 of [TG09]. The relative contributions of HDVs (including buses) and LDVs (including cars and light vans) was estimated using ADMS-Urban, with traffic figures from 2007, the most recent available. The model was set up for HDVs only, and run to give the NOx concentration at diffusion tube LF1. This was 32.4μgm^{-3}. The model was run again for LDVs only, and the concentration at SC5 was 17.9 μgm^{-3}. The respective contributions are therefore HDV: 64%, LDV: 36%.

The annual mean concentration at **LF1** for 2008 was 50 μgm^{-3}. We now apply the method of Box 7.1:

Step 1 The national background maps give **[TB-NO_2] = 13.4 μgm^{-3}** and **[TB-NO_x] = 17.4 μgm^{-3}**. The regional background is **[RB-NO_x] = 7.0 μgm^{-3}**. Thus

[LB-NO_x] = [TB-NO_x] - [RB-NO_x] = **10.4 μgm^{-3}**.

Step 2 The total background is apportioned to local and regional elements:

[RB-NO_2] = [TB-NO_2] X ([RB-NO_x]/[TB-NO_x]) = **5.4 μgm^{-3}**.
[LB-NO_2] = [TB-NO_2] X ([LB-NO_x]/[TB-NO_x]) = **8.0 μgm^{-3}**.

Step 3 The worst-case local NO_2 contribution is

[L-NO_2] = [T-NO_2] - [TB-NO_2]) = **36.6 μgm^{-3}**.

Step 4 The results from the ADMS modelling are used to find the relative contributions of heavy and light vehicles:

NO_2 from lorries and buses = 64% X [L-NO_2] = **23.4μgm^{-3}**
NO_2 from light vehicles = 36% X [L-NO_2] = **13.2μgm^{-3}**

The final source apportionment is:

Regional background		**5.4μgm^{-3}, (11%)**
Local background		**8.0μgm^{-3} (16%)**
Local traffic:	**buses and lorries**	**23.4μgm^{-3} (47%)**
	light vehicles	**13.2μgm^{-3} (26%)**

The largest contribution to nitrogen dioxide concentrations is from heavy duty vehicles.

The calculation can be repeated for the tube LF2, where the annual mean nitrogen dioxide concentration for 2008 was 50 μgm^{-3}. ADMS Urban modelling using traffic counts from 2007 (the most recent available) gave the relative contributions to NOx levels to be HDV 55%, LDV 45%.

The annual mean concentration at **LF2** for 2008 was 38μgm^{-3}. We now apply the method of Box 7.1:

Step 1 The national background maps give **[TB-NO_2] = 13.4 μgm^{-3}** and **[TB-NO_x] = 17.4 μgm^{-3}**. The regional background is **[RB-NO_x] = 7.0 μgm^{-3}**. Thus

[LB-NO_x] = [TB-NO_x] - [RB-NO_x] = **10.4 μgm^{-3}**.

Step 2 The total background is apportioned to local and regional elements:

[RB-NO_2] = [TB-NO_2] X ([RB-NO_x]/[TB-NO_x]) = **5.4 μgm^{-3}**.
[LB-NO_2] = [TB-NO_2] X ([LB-NO_x]/[TB-NO_x]) = **8.0 μgm^{-3}**.

Step 3 The worst-case local NO_2 contribution is

[L-NO_2] = [T-NO_2] - [TB-NO_2]) = **24.6 μgm^{-3}**.

Step 4 The results from the ADMS modelling are used to find the relative contributions of heavy and light vehicles:

NO_2 from lorries and buses = 55% X [L-NO_2] = **13.5μgm^{-3}**
NO_2 from light vehicles = 45% X [L-NO_2] = **11.1μgm^{-3}**

The final source apportionment at LF2 is:

Regional background		**5.4μgm^{-3}, (14%)**
Local background		**8.0μgm^{-3} (21%)**
Local traffic:	**buses and lorries**	**13.5μgm^{-3} (36%)**
	light vehicles	**11.1μgm^{-3} (29%)**

4.4 Projection to 2010

Box 2.1 of [TG09] gives projection factors for future years. The concentration measured at LF1 in 2008 was 50μgm^{-3}. Projecting to 2010 involves looking up the factors for 'Rest of UK' in Box 2.1 and multiplying:

NO_2[2010] = NO_2[2008]X(0.861/0.935) = **46μgm^{-3}**.

Thus the prediction is that at LF1 the air quality objective will not be met by 2010 if no further action is taken.

The concentration at LF2 in 2008 was 50μgm^{-3}. For 2010 the concentration is projected to be 35μgm^{-3}. This is below the air quality objective, as one would expect.

4.5 Local Traffic data

Traffic survey locations are depicted on Figure 5 below and the data obtained in Tables 4 to 9 below. The following sources were considered

- National Traffic Surveys (link census counts) –measured 12 hour and estimated 24-hour flows, together with breakdown of vehicle use-class. [Tables 6, 8 and 9]
- Automatic traffic data (long term monitoring programme, 24hr AADT flows) [Tables 4, 5 and 7]

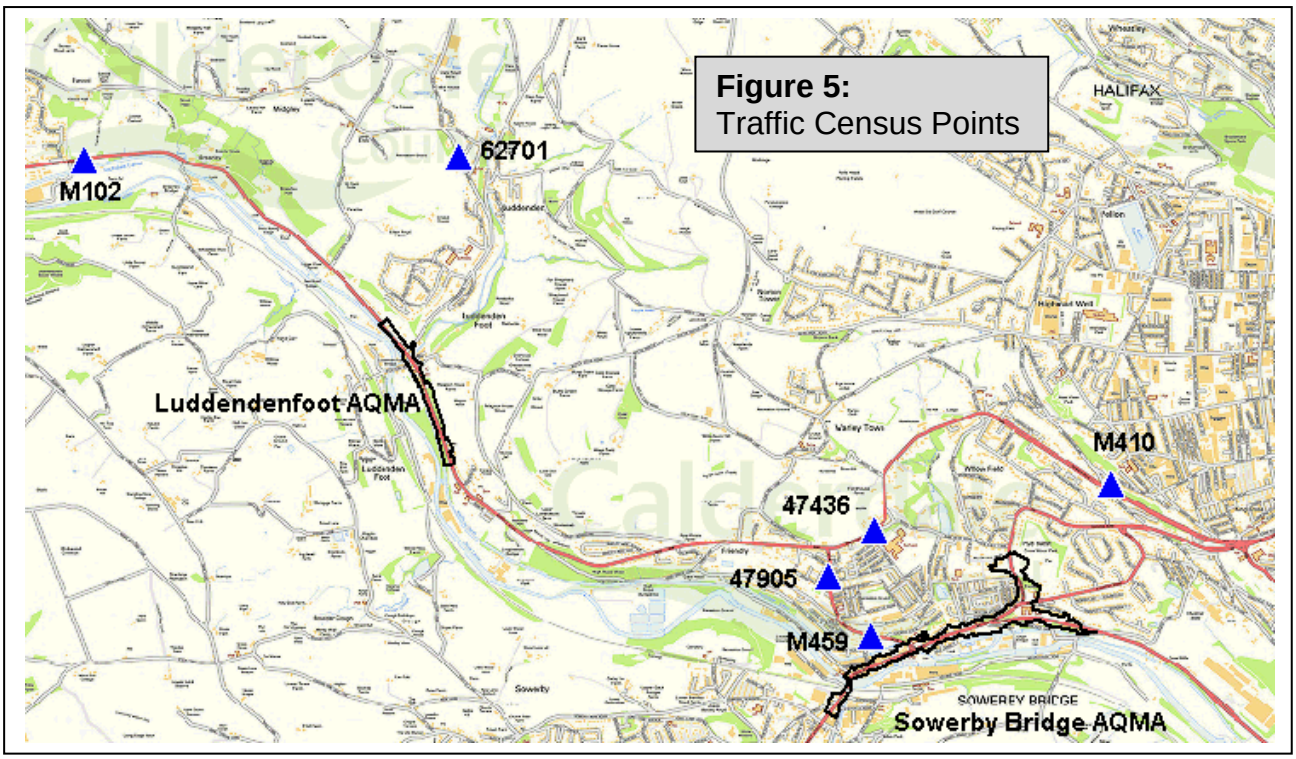


Figure 5:
Traffic Census Points

Table 4: Traffic census site M102 - A646 Burnley Rd (East of Mytholmroyd) 2005			
Direction	total vehicles		
	08:00-09:00 weekday	17:00-18:00 weekday	24hour weekday
Westbound	546	727	8409
Eastbound	678	593	8218
2-way count	1224	1320	16627

Table 5: Traffic census site M410 - A646 Burnley Rd, Halifax 2007			
Direction	total vehicles		
	08:00-09:00 weekday	17:00-18:00 weekday	24hour weekday
Westbound	439	721	7180
Eastbound	823	457	7628
2-way count	1262	1178	14808

Table 6: Traffic Census site 47436, A646 Burnley Road, Friday 15 Oct 2007									
Northbound Count / Southbound Count	Pedal Cycle	Motor Cycle	Cars & Taxis	PSV	Light Goods	Rigid Axle vehicles	Articulated Axle vehicles	TOTAL	%age vehicles > 1.5t
Measured 12 hour EB count	20	44	4892	182	880	181	40	6245	6.5%
Estimated 24 hour EB count	24	50	5520	205	995	205	45	7044	6.5%
Measured 12 hour WB count	24	52	5187	158	893	225	50	6589	6.6%
Estimated 24 hour WB count	27	59	5851	178	1007	254	56	7432	6.6%
Estimated 24 hour 2-way count	51	109	11371	383	2002	459	101	14476	6.55%

Table 7: Traffic census site M459- A6139 Tuel Lane Sowerby Bridge 2007			
Direction	total vehicles		
	08:00-09:00 weekday	17:00-18:00 weekday	24hour weekday
Northbound	313	412	5576
Southbound	374	465	6076
2-way count	687	877	11620

Table 8: Traffic Census site 47905, A6139 Tuel Lane, Friday 31 May 2002									
Northbound Count / Southbound Count	Pedal Cycle	Motor Cycle	Cars & Taxis	PSV	Light Goods	Rigid Axle vehicles	Articulated Axle vehicles	TOTAL	%age vehicles > 1.5t
Measured 12 hour SB count	10	67	4116	77	674	162	10	5116	4.9%
Estimated 24 hour SB count	11	74	4527	85	741	178	11	5625	4.9%
Measured 12 hour NB count	9	44	2880	73	594	123	11	3734	5.5%
Estimated 24 hour NB count	10	48	3168	80	653	135	12	4106	5.5%
Estimated 24 hour 2-way count	21	122	7695	165	1394	313	23	9731	5.2%

Table 9: Traffic census site 62701- New Road (unclassified), Luddendenfoot, Friday 18 May 2007									
Northbound Count / Southbound Count	Pedal Cycle	Motor Cycle	Cars & Taxis	PSV	Light Goods	Rigid Axle vehicles	Articulated Axle vehicles	TOTAL	%age vehicles > 1.5t
Measured 12 hour SB count	3	4	761	30	136	14	0	948	4.6%
Estimated 24 hour SB count	4	5	836	33	149	15	0	1042	4.6%
Measured 12 hour NB count	4	5	739	28	141	16	1	934	4.8%
Estimated 24 hour NB count	5	6	813	30	155	17	1	1027	4.8%
Estimated 24 hour 2-way count	9	11	1649	63	304	32	1	2069	4.7%

The A646 is the main east-west route between Halifax and Todmorden via Luddendenfoot, The A6139 at Sowerby Bridge affords a connection to Elland, the M62, Ripponden and an alternative route to Brighouse avoiding Halifax. Table 9 confirms that local traffic is a small proportion of the total, compared to the volume of through- traffic including the 6.5% of vehicles recorded as public service and HGVs in Table 6.

Comparison of Table 4 with Tables 5 and 6 suggests that site M102 east of Mytholmroyd presents the better estimate of through traffic at Luddendenfoot . Hence for the purpose of any modelling within the AQMA the volume data for site M102 will be assumed, with the HGV component of 6.55% as shown by site 47436 (table 6).

The Council also referred to the Department for Transport's "Transport Statistics Bulletin – Road Traffic Statistics for Great Britain 2005 – Statistics Report SB (06)28" of July 2006. This document would describe the A646 as a principal urban 'A' road, maintainable by the local authority, and offers the following in respect of such roads

- some 80% of all motor traffic is cars and taxis
- a typically motor vehicle flow for the Yorkshire and Humberside region would be between 18700 and 20000 vehicles a day
- goods vehicle traffic peaks slightly during the autumn period and mid week (Wednesdays/ Thursdays). Goods vehicle traffic is concentrated between 6am and 5pm, tailing off outside normal working hours
- car traffic on urban roads is more evenly distributed throughout the year and rises slowly from Mondays, peaking on Fridays.

In 2005 at site M102 and in 2007 at sites 47436 and M410 on the A646 the AADT 24-hour flow was below the regional average at 16627, 14476 and 14808 vehicles respectively (see tables 4, 5 and 6). The proportion of cars and taxis to all motor vehicles in 2007 (79% based on the 12-hour count- see table 6) mirrored the 2005 regional average.

4.6 Developments affecting the AQMA

There have been no significant developments since this AQMA was declared.

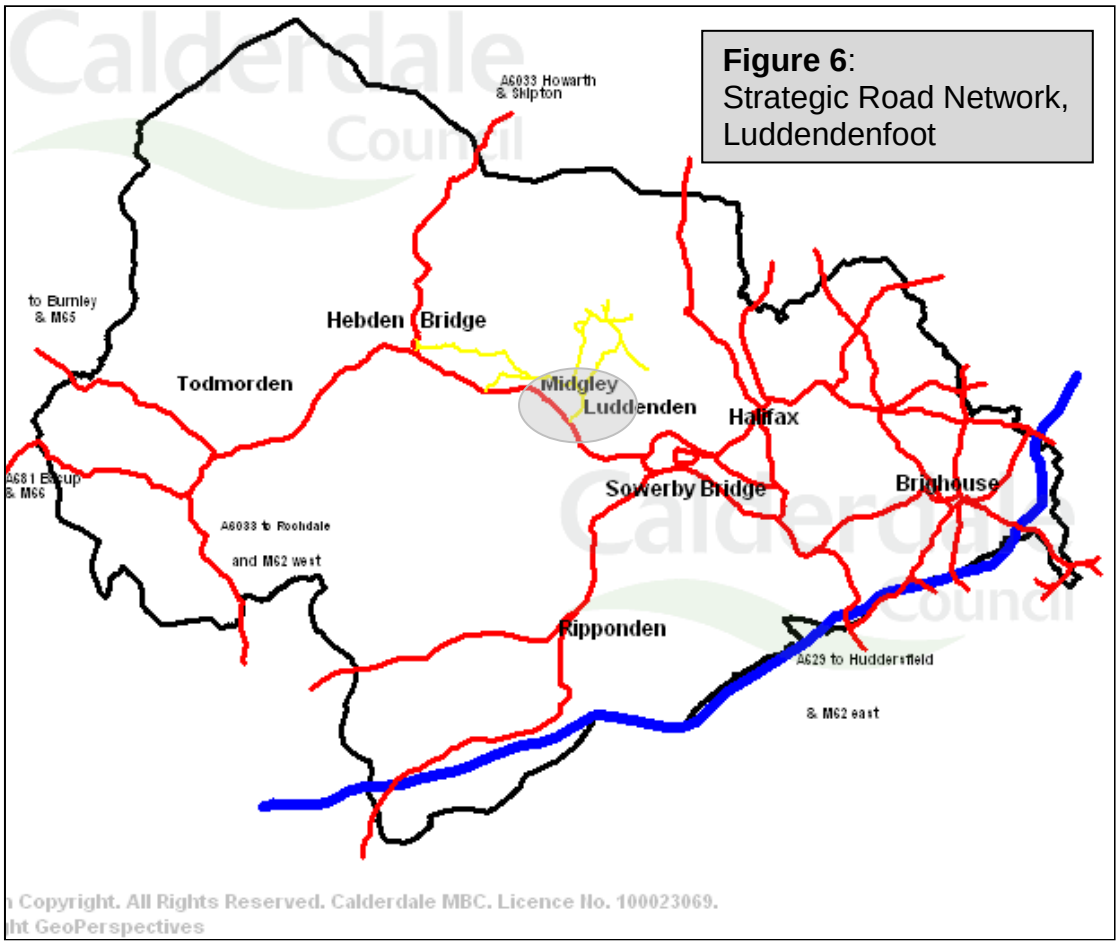


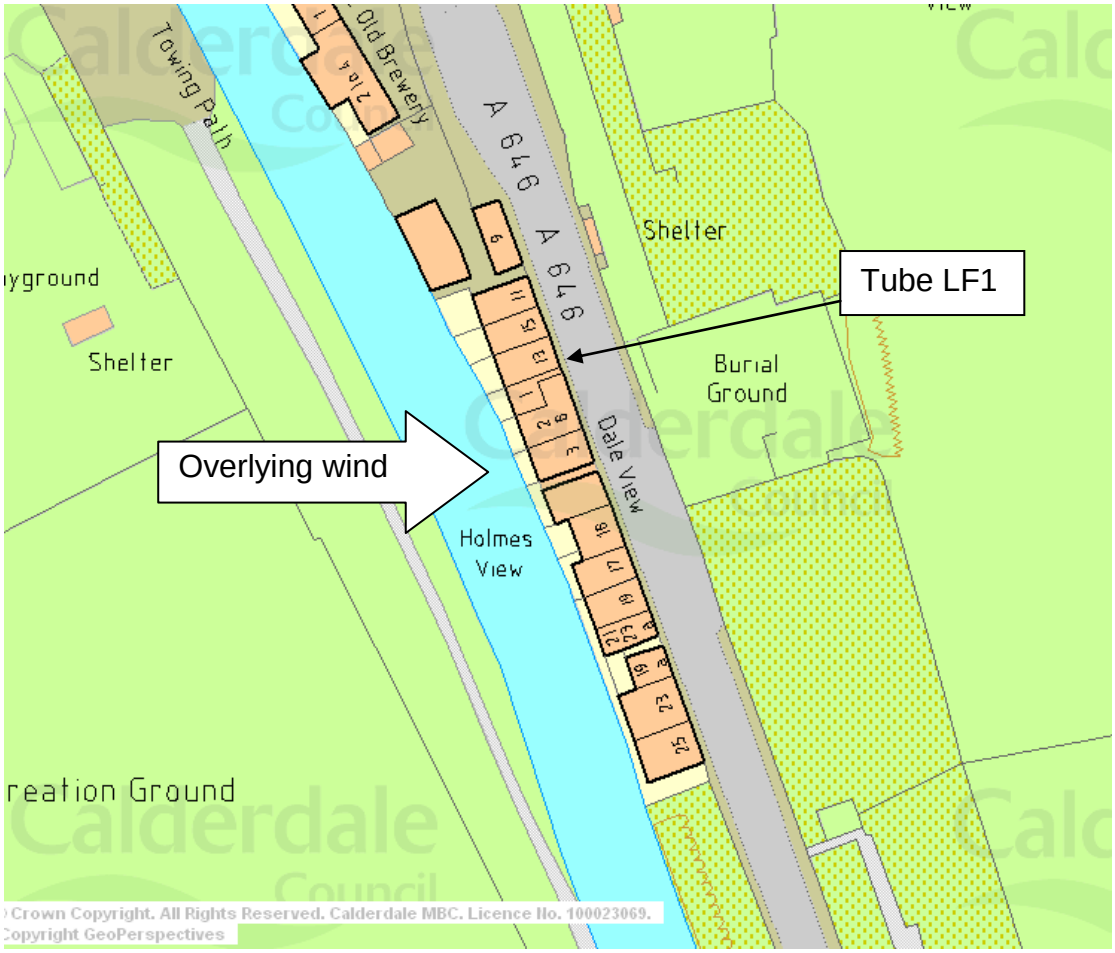
Figure 6:
Strategic Road Network, Luddendenfoot

5 Diffusion tube LF1, Burnley Road

Figures 7 and 8 show the location of LF1 in relation to two gas flues.

Figure 7

Figure 8



Map 1 indicates the overlying wind direction and the layout of the buildings close to LF1.

The levels of NO_2 measured at LF1 seem untypical for the area. They have consistently exceeded the AQO and triggered the deployment of other diffusion tubes. The results from the other tubes suggest that LF1 is experiencing higher levels of NO_2.

LF1 is located 2.5m above the ground, 1.2m from the roadside, but due to on-street car parking the effective distance from the A646 is likely to be closer to 3m. The tube is suspended in an aluminium bracket with spacing from the building frontage. There are two new gas flues serving renovated properties venting onto the front street some 8-9m away from LF1. One flue vents at around 2.5m above the ground, the other at ground level.

With the exception of the terraced houses on Burnley Road near LF1 monitoring carried out since the declaration of the AQMA indicates that NO_2 levels are close to or are below the AQO and projections to 2010 suggest that the AQO will be met in 2010 without active intervention.

The annual mean nitrogen dioxide level for diffusion tube LF1 on Burnley Road for 2008 was 53 microgrammes per cubic metre (μgm^{-3}). The objective is 40 μgm^{-3}. There is some doubt as to whether the 2008 mean is wholly due to road traffic emissions. Several of the properties on the terrace have been redeveloped with new gas flues venting onto the roadside. The terrace is in the lee of the prevailing wind, and it is possible that nitrogen dioxide from these flues disperses poorly. This may contribute to the measured concentration at LF1.

That is not to say that road traffic does not contribute significantly to nitrogen dioxide at this site, but the modelling of traffic emissions using both DMRB and ADMS-Urban indicates levels closer to 40μgm^{-3} at this location.

A further diffusion tube (LF1A) has been deployed on the opposite side of the road to LF1 as of February 2009. This should help to distinguish between the road traffic and other sources, eg if gas flue emissions are adversely affecting readings here..

6 Summary and Conclusions

This report estimates that the background concentration of Nitrogen Dioxide (NO_2) in the Luddendenfoot area in 2008 was 13.4μgm^{-3}, and that this background level is presently projected to fall to about 12.3μgm^{-3} in 2010.

It notes that in 2008 real-time measured annual mean levels of NO_2 at LF1 are in the region of 50$\mu g/m^3$. Such levels are clearly in excess of the Air Quality Objective (AQO), but a projection suggests that real time measurements might fall to around 46$\mu g/m^3$ by 2010. Similar projections for the diffusion tubes placed throughout the AQMA indicate that the annual means will not exceed the AQO in 2010.

These matters will be more fully explored in the Air Quality Action Plan (AQAP.

Environmental Health, Housing and Environment Services
Calderdale Metropolitan Borough Council

This Assessment is open to public comment until 1 July 2010.

Comments should be made to
Head of Service, Environmental Health, Housing and Environment Services,
Calderdale MBC,
Northgate House, Northgate, Halifax, HX1 1UN

Appendix 1: Monitoring and Quality Control

The Council uses two different methods to measure nitrogen dioxide levels across the Borough.

We use an electrically powered monitor in a roadside cabin (either a 'Romon' or a 'Groundhog'). The monitor draws air in and analyses it to **continuously monitor** NO_2 at that location. The data is analysed to give hourly means, monthly and annual statistics etc. We have 5 continuous monitors across the Borough but none at Luddendenfoot. We also use '**passive diffusion'** tubes. They are exposed at monitoring points across the Borough, for a month at a time before being sent away for analysis, with results given as the level of NO_2 for that month. Results are then averaged for the year. Some tubes are located close to the inlet of a continuous monitor to allow a comparison of results from both monitors.

We derive average NO_2 concentrations for a whole year from the two different sets of monitor. Since the Romon gives more accurate and precise readings than are derived from the diffusion tubes we adjust the tube results by comparing them with the results from the Romon. This is called **bias correction**. Sometimes a tube is deployed for only a part-year. We adjust those results by comparing them to tubes where a full year of results is available. This is called **period correction.** Where no data is available we use computer programs to predict or **model** levels of pollution, or refer to the National Inventory, latterly in respect of likely background concentrations. They offer the best estimates of pollution in the absence of monitoring data, but are subject to several limitations and they cannot replace actual measurement.

Equipment

The air quality monitoring in Luddendenfoot is carried out using diffusion tubes.

Diffusion Tubes are supplied and analysed by West Yorkshire Analytical Services. They are prepared using 50% TEA in acetone and are exposed for approximately 1 month.

Raw Data and Calculations

All raw data received from the laboratory is entered on a spreadsheet and saved to a secure network. Bias correction and other calculations are carried out on copies of the raw data, which is therefore preserved for future analysis.

Bias correction is based on continuous monitoring at Romon 4, a roadside continuous monitor located in Sowerby Bridge, approximately 4km from Luddendenfoot. The collocation data is included in the national study, and the bias correction factors are derived from that study.

Note added August 2009:

West Yorkshire Analytical services has demonstrated satisfactory performance in the WASP scheme for analysis of NO2 diffusion tubes, January 2008 – January 2009. The laboratory is rated 'good' on both sets of criteria at www.laqmsupport.org.uk/no2qaqc.php

If you would like this information in another format or language, please contact:
Halifax (01422) 392373

আপনি যদি এই তথ্য অন্য কোন মাধ্যম অথবা ভাষায় চান তাহলে দয়া করে যোগাযোগ করুন ঃ

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