Walsall Metropolitan Borough Council

Detailed Assessment of Air Quality

Report Number 3 of 7

PM_{10} – Highfields South Quarry

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Walsall Metropolitan Borough Council

Pollution Control Division

Planning and Transportation Services

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Executive Summary

Part IV of the Environment Act 1995 places a statutory duty on local authorities to periodically review and assess air quality within their area.

A Detailed Assessment is a requirement of the second round of review and assessment (the 'Second Round') for local authorities that have identified areas where there is a risk of exceedence of an air quality objective within their Updating and Screening Assessment (USA).

Walsall Metropolitan Borough Council has undertaken a Detailed Assessment in respect of the 24 hour mean and annual mean for PM_{10} fine particles (to be achieved by 31/12/04) due to uncontrolled and fugitive emissions at relevant locations close to Corey Environmental (Midlands Ltd.) – Highfields South (a mineral extraction site).

The assessment has followed the guidance provided by Central Government in its Policy and Technical guidance (LAQM.PG(03) & LAQM.TG(03)) published under Part IV of the Environment Act 1995.

This Detailed Assessment has concluded that it is not necessary for the authority to declare an air quality management area in this region. Consequently the authority has finished the current monitoring programme for fugitive PM_{10} emissions arising from the site.

Contents

Figures and Tables

1 Introduction

1.1 Project Background

1.1.1 Part IV of the Environment Act 1995 places a statutory duty on local authorities to periodically review and assess air quality within their area. A Detailed Assessment is a requirement of the second round of review and assessment (the 'Second Round') for local authorities that have identified areas where there is a risk of exceedence of an air quality objective within their Updating and Screening Assessment (USA).

1.2 Summary of Review and Assessment

1.2.1 The Local Air Quality Management (LAQM) regime was first set down in the 1997 National Air Quality Strategy (NAQS)[1] and introduced the idea of local authority 'Review and Assessment'. Central government subsequently published policy and technical guidance related to the review and assessment process in 1998. In 2000, government reviewed the NAQS and set down the Air Quality Strategy (AQS) for England, Scotland, Wales and Northern Ireland[2] This contained a revised framework for air quality standards and objectives for seven pollutants, which were subsequently enacted through the Air Quality Regulations 2000[3]. These were amended in 2002[4].

1.3 The First Round of Review and Assessment

1.3.1 Walsall Metropolitan Borough Council undertook the first round of review and assessment (the 'First Round') between 1998 and 2002. The First Round was a three-stage process, which assessed the sources of seven air pollutants of concern to health: benzene, butadiene, carbon monoxide, lead, nitrogen dioxide (NO_2), fine particles (PM_{10}) and sulphur dioxide.

1.3.2 The conclusions of the First Round were that all Air Quality Objectives were expected to be met by the target dates, with the exception of the annual mean objective for nitrogen dioxide (to be achieved by 31/12/05) at relevant locations close to certain roads / road junctions within the Borough. Consequently five Air Quality Management Areas were declared and are detailed in Table 1. Maps of these areas are available for viewing in the report of the third stage review and assessment of air quality in Walsall – Nitrogen dioxide addendum and at www.walsall.gov.uk/environment/pollution.asp

Table1: Air Quality Management Areas in Walsall

AQMA	Description
Areas 1, 2 and 3	Each area consisting of a corridor centred along a precise stretch of the M6 (between junction 9 and 11)
Area 4:	An area centred on the A461 Lichfield Street / Lichfield Road and the A454 Mellish Road between the traffic islands of the A4148 Broadway North and the minor roads of Borneo Street and Leigh Road.
Area 5:	The Rushall Crossroads to include residential properties in Station Road, B4154 Daw End Lane and A461 Lichfield Road.

1.4 The Second Round of Review and Assessment

1.4.1 The Second Round commenced in 2003. New Technical Guidance (LAQM.TG (03))[5], Policy Guidance (LAQM.PG (03))[6] and Progress Report Guidance (LAQM.PRG (03))[7] were issued on behalf of Department for Environment Food and Rural Affairs (DEFRA) in 2003 which set the framework for the requirements of review and assessment for future years, taking account of experiences from the previous round of review and assessment.

1.4.2 The Updating and Screening Assessment (USA) was the first phase of the Second Round. Similar to Stage One of the First Round, there was consideration of the seven pollutants of concern to health and an assessment was made as to whether Air Quality Objectives for these pollutants would be met. Walsall Metropolitan Borough Council completed this in July 2003, with the conclusion that Detailed Assessments were required in respect of the following:

- The 0.25 μg m^{-3} annual mean standard for lead (to be achieved by 31/12/08) at relevant locations close to two particular industrial process – Brookside Metal Company Limited and Chamberlain & Hill plc.
- The 24 hour mean and the annual mean for PM_{10} (to be achieved by 31/12/04) due to uncontrolled and fugitive emissions at relevant locations close to Corey Environmental (Midlands Ltd.), Vigo-Utopia Landfill site (operational landfill), DSM (Midlands Ltd) (materials recycling site) and Corey Environmental (Midlands Ltd) - Highfields South (a mineral extraction site).
- The annual mean objective (to be achieved by 31/12/05) for nitrogen dioxide at relevant locations close to certain roads / junctions within the Borough.
- The annual mean objective and the one - hour mean objective (to be achieved by 31/12/05) for nitrogen dioxide at relevant locations close to the town centre bus station.

All other Air Quality Objectives are expected to be met.

1.5 Scope and Methodology of the Detailed Assessment

1.5.1 The approach to the Detailed Assessment is to provide the local authority with an opportunity to supplement the information they have gathered in their earlier review and assessment work and more accurately assess the impact of pollution sources on local receptors at identified hot-spots.

1.5.2 The Detailed Assessment will identify with reasonable certainty whether or not there is likely to be an exceedence of the objectives and if so, define the extent and magnitude of the exceedence.

1.5.3 The Detailed Assessment has been undertaken in accordance with the methodologies provided in the Technical Guidance (LAQM. TG (03)[5].

2 Detailed Assessment for PM_{10} – Highfields South Mineral Extraction Site

2.1 Perspective

2.1.1 Work completed to date in the second round of the air quality review and assessment in Walsall has identified the potential for exceedance of the current PM_{10} air quality objectives from Highfields South mineral extraction site.

2.1.2 A detailed assessment of PM_{10} emissions from this site was therefore recommended.

2.2 Scope

2.2.1 For the purpose of this detailed assessment, concentrations of PM_{10} fine particles arising from fugitive emissions have been assessed against the current air quality objectives, which are:

- 40 µg m^{-3} as the annual mean to be achieved by the end of 2004
- 50 µg m^{-3} as the fixed 24-hour mean to be exceeded on no more than 35 days per year, to be achieved by the end of 2004.

2.2.2 The objectives are based upon measurements carried out using the European gravimetric transfer reference sampler or equivalent.

2.3 Identification of Hot-spots at Relevant Local Receptors

2.3.1 Whilst emission data is available for a variety of fugitive sources, for example those published within the Compilation of Air Pollution Emission Factors (USEPA-42), these factors are subject to a variable degree of uncertainty and frequently require default assumptions to be made. Their principal application lies in allowing predictions to be made for the impact of operations which are currently not in existence, or which are expected to undergo significant change by 2004 or 2010.

2.3.2 Therefore, due to the uncertainties associated with PM_{10} emission rates from uncontrolled and fugitive sources, this detailed assessment focuses upon a monitoring programme undertaken in accordance with guidance contained within LAQM (TG03)[5].

2.3.3 This monitoring program has been conducted at a position (Highfields farm) relevant to public exposure where consideration has been given to the siting of the sampling location in relation to Highfields South mineral extraction site. This site represents a location where exposure to dust emissions are likely to be relatively high (downwind from the source based upon the assumption that the prevailing winds having a southerly component). Figure 1 identifies the location of the monitoring station in relation to the mineral extraction site.

2.3.4 Whilst the authority recognises that monitoring should ideally be carried out for a period of at least 12 months, this has proven onerous given resource implications, the limited number of suitable PM_{10} monitors owned by the authority and the number of other uncontrolled and fugitive sources that require a monitoring programme as part of a detailed assessment. The monitoring program however has been carried out over a period of almost 6 months and incorporates more than 90% data capture with any gaps in the data spread throughout the year.

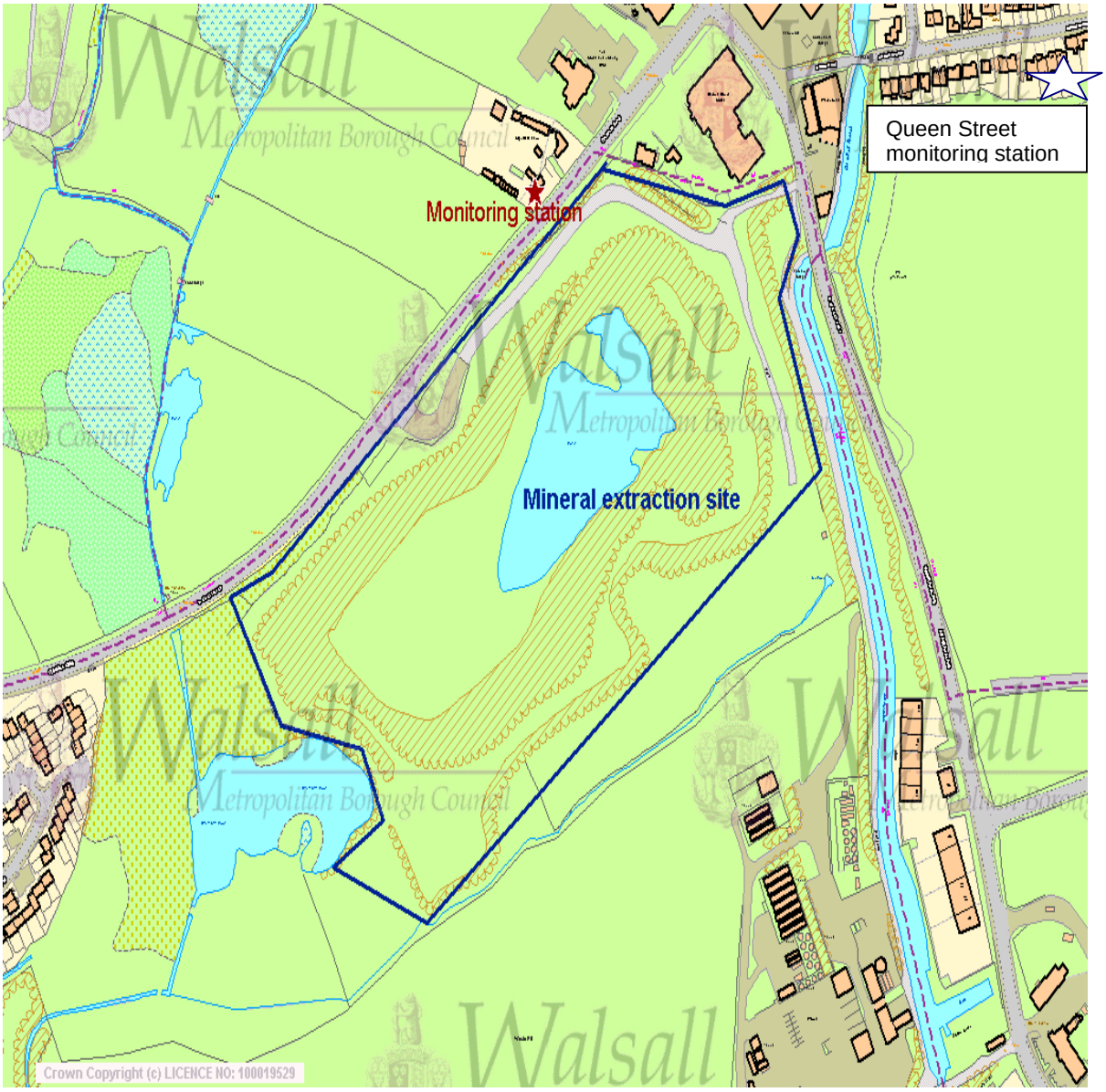
2.3.5 The authority also accepts that monitoring has not been carried on over the summer months when wind-blown re-suspension of dusts is likely to be highest. The results of this local

monitoring programme have thus been compared with data from national network sites, to assist with the interpretation of findings.

2.3.6 An unrelated PM_{10} monitoring program has previously been carried out at a further location – Queen Street Monitoring Station. This monitoring program was carried out as part of a detailed assessment in relation to emissions of PM_{10} from Vigo Utopia operational landfill. The details of this survey are available in Walsall Metropolitan Borough Councils Detailed Assessment Report number 2 of 7, PM_{10} – Vigo Utopia operational landfill www.walsall.gov.uk/environment/pollution.asp

2.3.7 The Queen Street monitoring station also represents a location of relevant exposure to dust emissions from Highfields South mineral extraction site (i.e. downwind from the source based on the prevailing wind direction) and provides useful additional data. Figure 1 identifies the location of the Queen Street monitoring station in relation to the mineral extraction site.

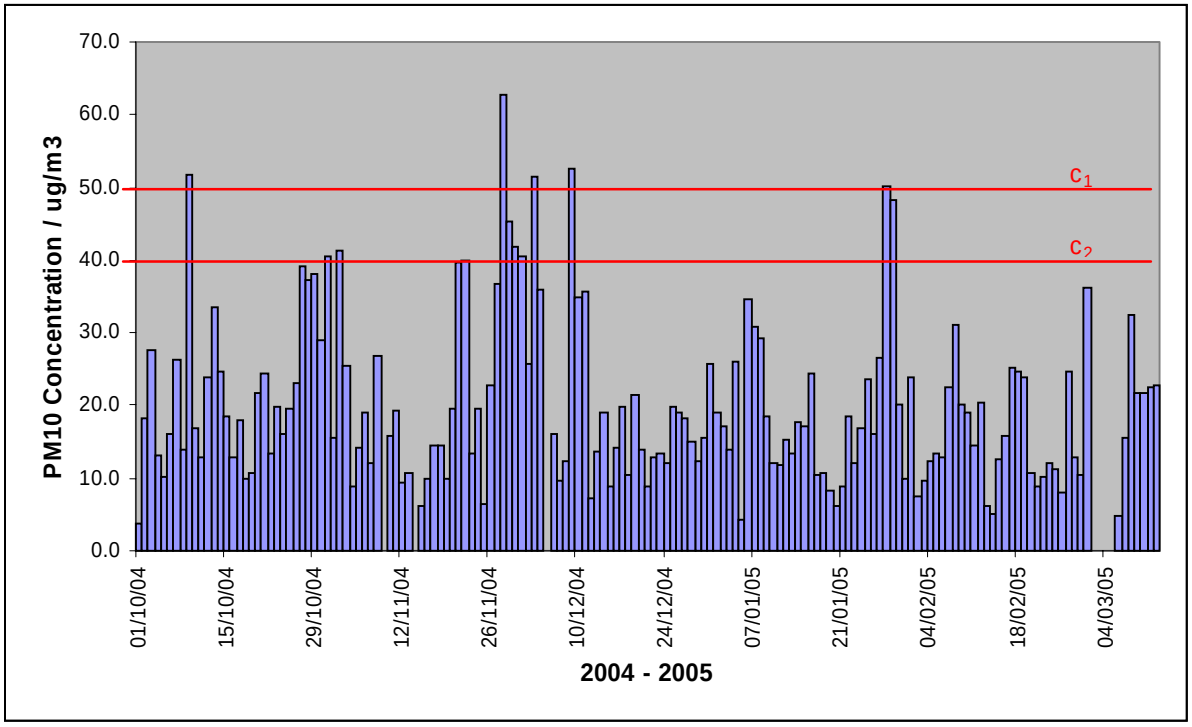
Figure 1: Highfields Farm Monitoring Station



3 Results

3.1 The fixed 24-hour PM_{10} mean values (00:00 – 2400hrs) for the period of monitoring (01/10/04 – 12/03/04) are shown in Figure 2 which also displays the two current air quality objectives in respect of PM_{10}. The mean PM_{10} concentration recorded for this period was 20.0 µg m^{-3}.

Figure 2: Fixed 24-hour PM_{10} Mean Values



C1 *40 ug m-3 as the annual mean to be achieved by the end of 2004*

C2 *50 ug m-3 as the fixed 24-hour mean to be exceeded on no more than 35 days per year, to be achieved by the end of 2004.*

3.2 The results from the Queen Street monitoring station are available in detail from Walsall Metropolitan Borough Councils Detailed Assessment Report number 2 of 7, PM_{10} – Vigo Utopia operational landfill site. A summary of the results is detailed in Table 2 below.

Table 2: Summary of Results from the Queen Street Monitoring Station

Air quality Objective	Result
40 µg m^{-3} as the Annual mean - to be achieved by the end of 2004.	Annual mean - 20.94 ug/m^3
50 µg m^{-3} as the fixed 24-hour mean to be exceeded on no more than 35 days per year - to be achieved by the end of 2004.	5 exceedences per year

4 Discussion

4.1 Figure 2 shows a monitoring period mean of 20.0 μg m^{-3} with five exceedences of the fixed 24-hour mean.

4.2 To assist with the interpretation of these findings, the results of this local monitoring programme have been compared with data from national network sites, (in accordance with a methodology provided in the Technical Guidance (LAQM. TG (03)) as follows.

- The measured mean concentration of PM_{10} at the Highfields Farm monitoring station (**M**) for the period 1 October 2004 to 12 March 2005 is 20.0 μg m^{-3}
- An adjustment is made based on the fact that patterns in pollutant concentrations usually affect a wide region. Thus if a three month period is above average at one place it will almost certainly be above average at other locations in the region. An adjustment procedure is therefore carried out.
- A nearby long-term monitoring site forming part of the national network was identified (Coventry memorial Park). Whilst this is approximately 30 miles away, it is a background site and should avoid any local effects. Furthermore this site is the only suitable site within a 50 mile radius with appropriate data capture.
- The annual mean, $\mathbf{A_m}$, for 2004 at Coventry memorial Park was obtained, being 15.8 μg m^{-3}
- The period mean , $\mathbf{P_m}$, for the period 1 October 2004 to 12 March 2005 at Coventry memorial Park was obtained – 16.6 μg m^{-3}
- The ratio, **R**, of the annual mean to the period mean ($\mathbf{A_m / P_m}$) for Coventry memorial Park is calculated as 0.95 (the adjustment factor).
- The measured period mean concentration **M** at the Highfields Farm monitoring station was multiplied by the adjustment factor **R** to give the estimate of the annual mean:-

$$\mathbf{M \times R = 20.0 \times 0.95 = 19.0\ \mu g\ m^3}$$

4.3 A review of the data in Figure 2 (incorporating the above interpretation) and Table 2 shows that ambient levels of PM_{10} at the monitoring site are already well below the annual mean air quality objective of 40 μg m^{-3} to be achieved by the end of 2004. (N.B. under such circumstances, concentrations measured at the Highfields Farm monitoring site have not been adjusted for any relevant future years).

4.4 The number of 24-hour exceedences of 50 μg m^{-3} (y) may be estimated using the relationship with the annual mean, as outlined within Technical Guidance (LAQM. TG (03) e.g.

Relationship between Annual Mean [PM_{10}] and the Number of Exceedences of the 24hr Standard

$$y = -18.5 + \left(0.00145 \times A_m{}^3\right) + \frac{206}{A_m}$$

4.5 An annual mean of 19.0 μg m^{-3} measured at the Highfields Farm station extrapolates to 2 exceedences per year.

4.6 As the monitoring program indicates that the objectives are highly unlikely to be exceeded, the authority considers it unnecessary to further refine the monitoring strategy in order to more clearly identify the source contributions.

5 Conclusions

5.1 At this stage, the authority has decided that it is not necessary to declare an air quality management area in this region and has now ended the current monitoring program for fugitive PM_{10} emissions arising from this site.

5.2 Any circumstances at the site which are likely to lead to a change in current fugitive and uncontrolled PM_{10} emissions from the source will be reviewed for the Authority's Progress Report which will be available later in 2005.

6 Quality Assurance and Quality Control

6.1 Introduction

6.1.1 This authority recognises that a documented quality assurance and control program should be followed in order that reliable and credible measurements are obtained and in summary has therefore adopted a rigorous QA/QC program that includes an established schedule of regular site servicing, validation of data, and documentation of all procedures.

6.1.2 In addition, an adequate programme of equipment maintenance / support and maintenance schedules for the replacement of consumable parts, diagnostic checks and equipment overhaul follows manufacturer's recommendations. Routine and non-routine service visits are fully documented and the exact service schedule and level of documentation is specified within a service contract.

QA/QC of the PM_{10} 'Partisol' Sampler

6.1.3 The 'partisol sampler' is operated in accordance with the manufacturers manual with the PM_{10} sampling head and accelerator assembly cleaned every 4 weeks.

6.1.4 In accordance with the Authority's laboratory protocol, pre-weighed glass fibre filters for the 'partisol sampler' are pre-conditioned for 48 hours in open dust protected sieve trays, in an air-conditioned weighing room with a temperature of 25 ± 1^{o}C and a relative humidity of 30 ± 5% before weighing. [It is noted that a temperature of 20 ± 1^{o}C and a relative humidity of 50% ± 3% is also satisfactory for this purpose]

6.1.5 The filters are then conditioned at 50 ± 1% RH for at least 24 hr prior to weighing on *Sartorius mp5 microbalance*. The balance is serviced by *Sartorius* engineers and calibrated to UKAS standards twice yearly.

6.1.6 Each filter is then exposed on site for 24 hours (midnight to midnight).

6.1.7 Each Filter is weighed after exposure on the same on *Sartorius mp5 microbalance* and a 24-hour mean PM_{10} concentration calculated for each filter.

6.2 Data Management

6.2.1 All the data collected by the authorities PM_{10} air quality monitoring network undergoes data processing and data validation and ratification.

6.2.2 The data is screened, by visual examination, to see if they contain spurious and unusual measurements. This allows identification of equipment faults or episodes of exceptionally high pollution are detected.

6.2.3 This initial data validation is followed by more thorough checking at 3-month intervals to ensure that they are reliable and consistent. This latter process is called data 'ratification'. Essentially, the data ratification procedure involves a critical review of all information relating to a particular data set, in order to verify, amend or reject the data. These methods of data management are outlined in more detail within the DEFRA publication Local Air Quality Management Technical Guidance-LAQM.TG(03).

7 References

[1] DoE (1997) The United Kingdom Nation Air Quality Strategy The Stationery Office

[2] DETR (2000) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland – Working together for Clean Air, The Stationery Office

[3] DETR (2000) The Air Quality Regulations 2000, The Stationery Office

[4] Defra (2002) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: Addendum, The Stationery Office

[5] Defra (2003) Technical Guidance LAQM.TG(03), Part IV of the Environment Act 1995, Local Air Quality Management, The Stationery Office

[6] Defra (2003) Policy Guidance LAQM.PG(03), Part IV of the Environment Act 1995, Local Air Quality Management, The Stationery Office

[7] Defra (2003) Progress Report Guidance LAQM.PRG(2003), Part IV of the Environment Act 1995, Local Air Quality Management, The Stationary Office