

The control of dust and emissions from construction and demolition

Best Practice Guidance



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Produced in partnership by London Councils and the Greater London Authority
with valuable assistance from the Building Research Establishment and the PRECIS Working Group
(Partnership in Reducing Emissions from Construction Industry Sites)

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BRE originally published five best practice documents in 2003, after years of research, and supports the use of their advice in this Guidance.

The APPLE (Air Pollution Planning and the Local Environment) working group was set up by London boroughs to work towards presenting clear air quality management options for planning issues across London. This group drafted the original Best Practice Guidance and requested that the Mayor adopt it, in partnership with London Councils as London wide Guidance to support the proposal in the Mayor's Air Quality Strategy.

Finally, the Partnership in Reducing Emissions from Construction Industry Sites (PRECIS) has been very supportive and has given plenty of advice in the drafting of this Guidance. As part of the work of PRECIS, the Energy Saving Trust (EST), Society of Motor Manufacturers and Traders (SMMT) and Environmental Industries Commission (EIC) have collaborated on a guide to help ensure the fitting of pollution control devices to construction machinery is done to the highest standards. The EST is now developing a formal register of approval devices.

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Foreword by Ken Livingstone, Mayor of London

Dust and other air pollution from demolition and construction can impact greatly on the health and quality of life of people working on and living close to these sites if they are badly managed. This Best Practice Guidance consolidates existing best practice used in London, UK and other countries to reduce emissions from these activities. London's local authorities will, for the first time, be able to apply advice from one source in a consistent way across the capital

I published my Air Quality Strategy in September 2002 and included a proposal to develop specific best practice guidance to reduce emissions from construction and demolition sites in London. Like other major cities in the World, London suffers from high levels of air pollution. Poor air quality damages peoples' health and affects their quality of life. In 2005 it was predicted that approximately 1,000 accelerated deaths and 1,000 extra respiratory hospital admissions occurred in London as a result of PM₁₀ air pollution. Demolition and construction sites can worsen local air quality locally, but through careful planning and good management, these impacts can be greatly reduced.

My London Plan and the associated Supplementary Planning Guidance provides the planning framework for London. They are used to manage the complex issues we now face to develop London - to absorb its expanding population, to provide adequate housing, employment, transport and leisure facilities, to develop the London Olympic facilities for 2012 and to develop the East Thames Corridor; and done with the minimal impact on London's environment.

The capital faces decades of construction. I have written this Best Practice Guidance in conjunction with London Councils so that our environment is protected during construction, as well as from the provision of more energy efficient buildings. I urge local planning authorities and developers to use this document to agree methods to reduce dust and other emissions during demolition and construction, ensuring that as much as possible is done to mitigate these works and help to make London a greener and more sustainable city.

Extra controls on exhaust emissions from plant and other construction vehicles have been mandated for some major project - the Big Dig in Boston, USA and by some governments - Switzerland and Sweden. I endorse the inclusion of similar controls in this BPG to complement my other strategies to reduce vehicle emissions, for example the Congestion Charging and proposed Low Emission Zone.

Ken Livingstone



Foreword by Councillor Cockell



As part of the Government's Air Quality Strategy, London local authorities have a responsibility regularly to review and assess air quality within their borough and work towards achieving the air quality objectives set for various pollutants. Concentrations of nitrogen dioxide and fine particles are predicted to exceed their objectives across most of London. Consequently, the majority of London boroughs have declared Air Quality Management Areas (AQMAs) and developed action plans outlining how they will work towards meeting these air quality objectives.

This Best Practice Guidance has been developed in partnership with the Mayor in recognition of the impact that significant development, particularly in the Thames Gateway, can have on Londoners' air quality. The aim is to assist developers, architects, environmental consultants, local authority officers and any parties involved in the construction process.

The Guidance outlines best practice and provides a consistent approach covering all aspects of dust control and emissions from construction and demolition activities. It will assist planners to incorporate appropriate conditions into planning permissions and assist developers in understanding the methods available to them and what might be expected of them by boroughs.

This Guidance builds on Building Research Establishment Guidance, and aims to replace or amend relevant parts of individual boroughs' code of construction practice documents already in place.

A handwritten signature in black ink, appearing to read 'Cockell'.

1 Introduction

Like other major cities in the world, London suffers from high levels of air pollution. Poor air quality can damage health and impact upon quality of life. In 2005 it was predicted that approximately 1,000 accelerated deaths and 1,000 extra respiratory hospital admissions occurred in London as a result of PM₁₀ air pollution.¹ Dust and emissions from demolition and construction work can worsen air quality, but through careful planning and good management, these impacts can be reduced.

The Mayor of London produced his Air Quality Strategy in September 2002, which contains a number of policies and proposals to improve air quality in London towards the government's health based air quality targets, which are set out in its National Air Quality Strategy². Specifically, policy 22 and proposal 47 states that the Mayor will seek to develop specific best practice guidance to reduce emissions from construction and demolition sites in London.

As part of the Government's Air Quality Strategy, local authorities have a responsibility to review and assess air quality within their borough and work towards achieving the air quality targets. Concentrations of nitrogen dioxide (NO₂) and fine particles (PM₁₀) are predicted to be above these targets across most of London. Consequently, the majority of London authorities have declared Air Quality Management Areas (AQMAs) and developed action plans, outlining how they will work towards the targets.

Many London boroughs have developed their own Considerate Contractors' schemes and these have been used successfully, along with the national scheme, to reduce the impact of demolition and construction sites. This guidance looks to build on existing best practice and new techniques, with particular regard to the issues below:

- undertaking Air Pollution Risk Assessments
- notification of works to local authorities
- emission standards for all off-road vehicle emission controls and information on after-treatment technologies
- approved lists of vehicles suitable to be fitted with pollution reduction technologies and which technologies are suitable (see www.est.org.uk)
- emission standards and the proposed London Low Emission Zone
- air quality monitoring protocol using a transect approach or monitoring at sensitive receptors
- requirement for no burning on any site
- demolition management
- waste and recycling management
- paving major haul routes used by HGVs
- training and identification of on-site staff responsible for pollution issues.

1.1 Impacts of air pollution from construction and demolition sites on the environment

There are a number of sources of dust and emissions from construction activities that can release a range of particles. This document refers to the following particles in a standard format throughout:

Dust - defined as all particulate matter up to 75 μm in diameter (according to BS6069) and comprising both suspended and deposited dust

PM₁₀ - a mass fraction of airborne particles with an aerodynamic diameter of 10 microns or less. It is comprised of *coarse* particles (2.5-10 μm in diameter), which are primarily from non-combustion sources and *fine* particles (less than 2.5 μm), which includes combustion processes or are formed in the atmosphere through the chemical reaction of primary emissions of gases.

Particulate matter includes a wide range of sizes and types of particles and will vary in composition from place to place and time to time.

Most dust particles are too big to be inhaled but can cause eye, nose and throat irritation and lead to deposition on cars, windows and property. PM₁₀ is of more concern to human health as the particles can enter the lungs, causing breathing and respiratory problems, with long-term health effects dominated by cardiovascular rather than respiratory problems³. The PM₁₀ size fraction is associated with a range of effects on health including respiratory and cardiovascular systems (ie asthma) and mortality (deaths brought forward). Particles can also carry adhered carcinogenic compounds into the lungs. The most vulnerable people are the elderly, the very young and those with existing heart and lung conditions.

The detrimental health impacts of PM₁₀ are not confined to the construction site. These particles can travel further than coarser dust and so can affect the health of people living and working in the surrounding area of the site.

Emissions of particles and dust from construction can also have an impact on indoor air quality in the neighbouring area. The Committee on the Medical Effects of Air pollution (COMEAP), a Department of Health expert group, has stated that it must be recognised that the indoor environment is not free of air pollutants with many pollutants generated outdoors penetrating indoors⁴.

Dust and PM₁₀ emissions can arise from a number of sources. Not only do construction activities need to be considered, but also emissions from on-road vehicles associated with the construction site and on-site machinery (off-road emissions) - including both static and non-road mobile machinery (NRMM). Using low sulphur tax-exempt diesel on site will automatically reduce emissions of particles by 30 per cent from the exhaust. The additional use of exhaust filtration measures for high risk sites (see Section 4.2) will reduce the remaining particulate emissions by a further 85 per cent.

The impacts of poor air quality can also be seen on flora and fauna. It is therefore important to consider the impact of dust on sensitive sites, such as Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSIs) and non-statutory Wildlife Sites in the vicinity of a construction site. These site-specific issues are identified in the Air Quality Risk Assessment (Section 4) and must be considered prior to the planning process, this is in line with the Habitats Directive (92/43/EEC) and Planning Policy Statement 9 (Biodiversity and Geological Conservation).

1.2 Benefits of London wide Best Practice

London's population is expanding and is expected to further increase to 8.1 million by 2016. The London Plan sets out the Mayor's vision to manage this increase, equivalent to absorbing the population of Leeds. London will experience the greatest amount of redevelopment of any UK city. The other demands for construction in London are for economic growth, investment in London's physical infrastructure, and repairs and maintenance of existing homes and buildings⁵. It has been estimated that there are as many as 10,000 active construction sites at any one time⁶; this figure takes account of all scales of development, from the minor house renovation to the large area regeneration schemes that take years to be completed. The London Plan⁷, published by the Mayor in 2004, sets out the strategic plan for the continued spatial development of London over the next 15-20 years. This document identifies that continued growth in population will be seen and, as a result a continued programme of redevelopment, will need to continue with recent commitments to build new housing and major transport infrastructure projects include Heathrow Terminal 5, Channel Tunnel Rail Link, Thames Gateway Bridge, Crossrail, along with regeneration of brownfield sites such as the Lower Lee Valley, Greenwich Peninsula/Millennium Village and Thameside developments (including Bankside and MORE London).

This Best Practice Guidance complements the Mayor's Supplementary Planning Guidance (SPG) on Sustainable Design and Construction. It

supports the implementation of the London Plan and is applicable to all building types and associated spaces. The SPG gives advice on designing buildings to reduce their impact on the environment and making them pleasant places for people to live or work. Advice includes reducing emissions of air pollutants and carbon dioxide, as well using spaces to benefit London's flora and fauna.

Some local authorities already have their own Considerate Contractors' Scheme, which tend to deal with the additional issues of noise, vibration and land contamination. As a result there are a number of different schemes currently in operation across London. It is envisaged that this London-wide Best Practice Guidance will provide much needed consistency of approach across all 33 boroughs.

Other commercial guidance is available to assist in the control of dust and other pollutant emissions specifically from construction, for example the following BRE Guidance offers good examples of current best practice:

- Control of dust from construction and demolition activity⁸
- Controlling particles, vapour and noise pollution from construction sites⁹.

CIRIA also facilitate discussion on best practice through its construction stakeholder forum, which allows knowledge to be shared and disseminated. However, due to the issues that London faces, it is apparent that there is a need for a common and more specific guidance to control pollution.

2 Legislative Framework for the Best Practice Guidance

All new developments that require planning approval from the local planning authority (LPA) may be subject to the requirements of this Best Practice Guidance. It is important for the developer and LPA to discuss the activities on site and agree what controls, if any, will be put in place prior to planning permission being granted.

Depending on the size of the development and the potential impact of a particular activity, the LPA may decide to make mitigation the subject of one or more planning conditions. The main legislative controls are identified below; further details are also provided in **Appendix 3: Relevant legislation and guidance**.

Developers should be aware that there are likely to be other pieces of legislation that are not covered in this document. In addition, the acts and regulations that have been identified within this document were correct at time of publication, if new legislation is introduced that sets higher standards, then this should be taken into account.

By following this Best Practice Guidance developers are identifying good practice methods for demolition and construction. Compliance with this document does not necessarily offer exemptions from prosecution under any of the legislation impacting upon demolition and construction, though it should be recognised that using Best Practicable Means (BPM) could be used as a defence from prosecution under the S.80 of the Environmental Protection Act 1990.

Developers should take elements of this Best Practice Guidance into account depending on the level of risk identified for the particular construction site. Where possible, best practice mitigation measures should be carried out at all times, although it may be impossible to fully comply with the guidance for certain emergency works. In these cases, the developer should provide the local authority with as much notice as possible.

Planning conditions

Recent guidelines in PPS23 set out the Government's policies on pollution control and planning. Annex 1 paragraph 1.48 regarding planning conditions states *"planning conditions could be used in respect of [...] impacts such as noise, vibrations, odour, air pollutants and dust from certain phases of the development such as demolition and construction"*. It is therefore appropriate to use this Best Practice Guidance to inform planning conditions, examples of which are included in **Appendix 2**. Prior approval of the best practice guidance using the planning system in this

way should avoid the need to deal with enforcement issues under other legislation. However, it is up to the individual local authority to decide whether a condition is appropriate and what level of enforcement is needed. However, it may be necessary for the LPA to set site-specific conditions for developments. More information on standard conditions can be found in London Councils' Planning Guidance¹⁰. In order to achieve the aims of the Best Practice Guidance it will be important to undertake negotiations early on in the planning process.

Health and Safety at Work Act 1974

The provisions of the Health and Safety at Work Act 1974 apply at all times on demolition and construction sites. The Health and Safety Executive (HSE) is the enforcing authority.

Research is continuing into the health effects of airborne pollutants and exposure to PM₁₀, though evidence is emerging that smaller particles within this fraction - below PM_{2.5} - may be the most harmful. As a first step to protect a worker's health and safety, emissions of airborne pollutants should always be minimised. However, where this cannot be achieved personal protective equipment should be provided and used. Proper planning should be undertaken and appropriate mitigation decided for demolition and construction projects that will potentially generate large quantities of dust or emissions.

The Building Act 1984

This Act and subsequent Building Regulations 2000 aim to ensure the safety of those within and close to a building during works. They are the main mechanism for a LPA to control the impact of demolition. Under the regulations the LPA must be informed of any proposed demolition at least six weeks before work is due to begin. It will then grant a notice for demolition prior to work commencing. Section 82(J) of the Building Act 1984 can be used by the LPA to place conditions on the demolition notice to ensure that effective dust management options are undertaken.

To facilitate a smooth application process, developers should consider and suggest to the LPA management techniques for dust control during demolition prior to their application.

Environmental Protection Act 1990

Under Part III of the Environmental Protection Act (EPA) 1990, emission of dust, fumes and other effluvia from construction sites can be identified as a statutory nuisance if prejudicial to health or a nuisance. Control of a statutory nuisance is contained within section 80 and a local authority is under a mandatory duty to serve an abatement notice on the person

responsible for the nuisance (or the owner or occupier of the premises on which the statutory nuisance is present) if it is satisfied that a statutory nuisance exists, or is likely to occur or recur¹¹.

Local Air Pollution Prevention and Control (LAPPC)

These regulations apply to smaller industrial activities, known as Part B Installations, such as concrete batching or concrete crushing. Local authorities, as the regulators, are responsible for controlling emissions from these premises and set conditions in permits they issue to achieve this. Conditions are based on Best Available Techniques (BAT)¹², which require that the cost of applying a technique is not excessive in relation to the environmental protection it provides. The Secretary of State for Environment, Food and Rural Affairs has produced Process Guidance Notes, which form the statutory guidance on what constitutes BAT for each regulated process. If the regulator believes the operator has contravened, or is likely to contravene any permit conditions, enforcement action can be taken.

Local authorities should be aware that certain installations, such as concrete batching, are not covered by authorisations on demolition and construction sites, but must be included as planning conditions.

3 How this guidance should be used

This guidance is designed to be used by developers, architects, environmental consultants, local authority officers and any other parties involved in any aspect of the construction process (including demolition and other associated activities).

This Best Practice Guidance builds on other guidance and augments individual local authorities' Considerate Contractors' Schemes and the experience of local authority officers. It establishes best practice that is relevant and achievable, with the overarching aim of protecting public health. It also aims to provide an overall mechanism to deal with the cumulative impacts of the many individual construction sites within a London borough. This document will therefore complement or replace individual borough's considerate contractors' documents, where they exist, and allows those boroughs that do not have their own scheme to access guidance to ensure proper management of demolition and construction sites.

The following three principles are well established and are central to the control strategies suggested by this Guidance. They follow a hierarchy to control the emissions of dust and other emissions and reduce human exposure:

- 1 prevention
- 2 suppression
- 3 containment.

The three principles are embedded in this guidance and are used in a way that is appropriate to the scale of a particular development and the potential exposure of site workers, residential neighbours and other susceptible receptors. The following pages illustrate how to assess a development for its potential risk and what controls and mitigation measures should be put in place.

The many forms of development that are taking place in London today preclude the use of a traditional generic template for all construction schemes. Officers recognise this and have incorporated the necessary flexibility required to deal with large-scale high priority sites as well as smaller scale sites. The guidance in this document will assist with the drafting of suitable planning conditions.

It is planned that this document will be reviewed as necessary, to provide an updated outline of new best practice in dust and emissions management.

4 Air Quality Impact Evaluation

The air quality impact of a development, both within and outside the site boundary, is listed in **Section 4.1** (site evaluation), which gives guidance on the likely impact of a development, based on size and location. The possible air quality risks and mitigation measures are outlined in **Sections 4.2 to 4.4** and are designed to provide a minimum standard for all sites in London and will help lower air pollution on site and help prevent it impacting on the locality past the site boundary.

It is essential to have effective dust and emission control measures in place for every dust generating activity carried out on site, not only to protect the health and safety of the on-site workforce, but also members of the public in the locality. The air quality impact evaluation applies to all proposed construction activities¹³, including site clearing, demolition and construction phases. The site evaluation must be conducted before any work activities begin on site.

In order to successfully control demolition and construction activity, it is important to evaluate the risk from pollutants emitted from site. It is envisaged that this approach will bring additional benefits, such as a reduction in the number of nuisance complaints; the majority of which relate to dust and noise emitted from construction activities. At the pre-planning stage, the site manager or developer should:

- 1 identify whether the demolition/construction site represents a low, medium or high risk by following the guidance in **section 4.1**
- 2 determine the risks and best practice measures that could be required by the local planning authority (LPA) for mitigation. See the flow diagrams in **sections 4.2, 4.3 or 4.4**
- 3 undertake an Air Quality Risk Assessment (AQRA) and outline how each risk will be mitigated on site. **Sections 6 and 7** give more detail of mitigation techniques
- 4 submit the AQRA to the LPA for assessment and to inform pre-planning discussions.

4.1 Site evaluation

The need and ability of a developer to deploy effective control measures is often dependant on the size and scale of a development. Therefore, it is the intention of this document that best practice activity uses three criteria to assess the potential impact of a demolition or construction site. These criteria take account of the:

- the area taken up by the development
- the number of properties being developed
- the potential impact of the development on **sensitive receptors** close to the development, for example housing, schools, hospitals and

other building uses which would be affected by high levels of air pollution or dust.

The potential for a demolition or construction site to impact at sensitive receptors is dependant on many factors, which include the following:

- location of the building site
- proximity of sensitive receptors
- whether demolition will need to take place
- extent of any intended excavation
- nature, location and size of stockpiles and the length of time they are to be on-site
- occurrence and scale of dust generating activities - including cutting, grinding and sawing
- necessity for on-site concrete crusher or cement batcher
- number and type of vehicles and plant required on-site
- potential for dirt or mud to be made airborne through vehicle movements and
- weather conditions.

A small number, or even one, of these factors may be the cause of increased or prolonged impact on sensitive receptors. In many cases developers' own experience will provide the knowledge needed to judge the likely impact of each activity.

Section 5 describes how an inventory and timetable of all dust generating activities should be included within the Method Statement and sent to the LPA, along with a description of relevant mitigation measures. The Method Statement should provide the LPA and developers with all the information they need for an informed discussion to agree the evaluation of a particular site into the low, medium or high risk categories.

The guidelines, below, illustrate what criteria a developer and LPA can use to assess the risk posed by a demolition or construction site. The following pages go further and recommend methods to mitigate specific risks.

Site Evaluation Guidelines

● Low risk sites

- Development of up to 1,000 square metres of land and;
- Development of one property and up to a maximum of ten and;
- Potential for emissions and dust to have an infrequent impact on sensitive receptors

● Medium risk sites

- Development of between 1,000 and 15,000 square metres of land and;
- Development of between ten to 150 properties and;
- Potential for emissions and dust to have an intermittent or likely impact on sensitive receptors

● High risk sites

- Development of over 15,000 square metres of land, or;
- Development of over 150 properties or;
- Major Development referred to the Mayor and/or the London Development Agency, or;
- Major development defined by a London borough or;
- Potential for emissions and dust to have significant impact on sensitive receptors

A LPA may have its own criteria to assess developments within its area, especially if a number of planned demolition and/or construction sites are due to occur concurrently. It is vital that the developer and LPA assess and agree, at the pre-planning stage, the site evaluation and the controls and mitigation measures needed on site.

Major developments referable to the Mayor

The Mayor's London Plan policy refers only to planning applications which must be referred to the Mayor according to Parts I - IV of the Town and Country Planning (Mayor of London) Order 2000. Examples include proposals for more than 500 dwellings, 30,000 square metres commercial space provided in the city or 20,000 square metres and 15,000 square metres of commercial space in and outside central London respectively.

See Appendix 7 for details.

Major developments as defined by the boroughs

Each borough is able to define what it considers to be a major development. It is suggested that the definition adopted by boroughs is that currently used both by the ODPM PPS2 form that each district planning authority must use to report general developments, and by other

London boroughs that have already adopted, or are in the process of adopting, a similar policy.

4.2 Mitigation Measures for Low Risk sites

These sites will be small developments on land with an area of up to 1,000 square metres with the potential for an infrequent impact on sensitive receptors. The following Best Practice Measures should be used:

● Low Risk

Site Planning

- Erect effective barriers around dusty activities or the site boundary (**Section 6.1**).
- No bonfires (**Section 6.11**).
- Plan site layout—machinery and dust causing activities should be located away from sensitive receptors (**Sections 6.1 and 7.3**).

Construction traffic

- All vehicles should switch off engines – no idling vehicles (**Section 7.3**).
- Wash or clean all vehicles effectively before leaving the site if close to sensitive receptors (**Section 6.3**).
- All loads entering and leaving site to be covered (**Section 6.2.3**).
- No site runoff of water or mud.
- All non road mobile machinery (NRMM) to use ultra low sulphur tax-exempt diesel (ULSD) where available (**Section 7.2**).
- On-road vehicles to comply with the requirements of a possible future Low Emission Zone (LEZ) as a minimum (**Section 7.1**).

Demolition Works

- Use water as dust suppressant (**Sections 6.10 and 6.13**).
- Cutting equipment to use water as suppressant or suitable local exhaust ventilation systems (**Section 6.8**).
- Securely cover skips and minimise drop heights (**Section 6.9**).

Site Activities

- Minimise dust generating activities (**Sections 6.8, 6.9, 6.10 and 6.15**).
- Use water as dust suppressant where applicable (**Section 6.6**).
- Keep stockpiles for the shortest possible time (**Section 6.7**).

4.3 Mitigation Measures for Medium Risk sites

These sites will be medium sized developments on land between 1,000 and 15,000 square metres with the potential for an intermittent or likely impact on sensitive receptors. The following Best Practice Measures should be used:

● Medium Risk

Site Planning

- Erect solid barriers to site boundary (**Section 6.1**).
- No bonfires (**Section 6.11**).
- Plan site layout – machinery and dust causing activities should be located away from sensitive receptors (**Sections 6.1 and 7.3**).
- Identify responsible person in charge (**Section 5**).
- Hard surface site haul routes (**Section 6.2.1**).

Construction traffic

- All vehicles to switch off engines – no idling vehicles (**Section 7.3**).
- Effective vehicle cleaning and specific wheel-washing on leaving site (**Section 6.3**).
- All loads entering and leaving site to be covered (**Section 6.2.3**).
- No site runoff of water or mud.
- All non road mobile machinery (NRMM) to use ultra low sulphur tax-exempt diesel (ULSD) where available (**Section 7.2**).
- On-road vehicles to comply with the requirements of a possible future Low Emission Zone (LEZ) as a minimum (**Section 7.1**).
- Hard surfacing and effective cleaning of haul routes and appropriate speed limit around site (**Section 6.2.3**).

Demolition Works

- Use water as dust suppressant (**Sections 6.10 & 6.13**).
- Cutting equipment to use water as suppressant or suitable local exhaust ventilation systems (**Section 6.8**).
- Securely cover skips and minimise drop heights (**Section 6.9**).
- Wrap buildings to be demolished (**Section 6.13**).

Site Activities

- Minimise dust generating activities (**Sections 6.8, 6.9, 6.10 and 6.15**).
- Use water as dust suppressant where applicable (**Section 6.6**).
- Enclose stockpiles or keep them securely sheeted (**Section 6.7**).
- If applicable, ensure concrete crusher or concrete batcher has permit to operate (**Sections 6.4 & 6.5**).

Implementation of the suggested mitigation measures above will help reduce the impact of the construction activities to low risk.

4.4 Mitigation Measures for High Risk sites

These sites will be large, or of strategic importance and defined so by a London borough, or referred directly to the Mayor or the London Development Agency, or have a potentially significant impact on sensitive receptors. The following Best Practice Measures should be used:

● High Risk

Site Planning

- Erect solid barriers to site boundary (**Section 6.1**).
- No bonfires (**Section 6.11**).
- Plan site layout – machinery and dust causing activities should be located away from sensitive receptors (**Sections 6.1 and 7.3**).
- All site personnel to be fully trained (**Section 5**).
- Trained and responsible manager on site during working times to maintain logbook and carry out site inspections (**Section 5**).
- Hard surface site haul routes (**Section 6.2.1**).
- Use nearby rail or waterways for transportation to/from site (**Section 7.4**).
- Put in place real-time dust monitors across site (**Section 8**).

Construction traffic

- All vehicles to switch off engines – no idling vehicles (**Section 7.3**).
- Effective vehicle cleaning and specific fixed wheel washing on leaving site and damping down of haul routes (**Section 6.3**).
- All loads entering and leaving site to be covered (**Section 6.2.3**).
- No site runoff of water or mud.
- On-road vehicles to comply to set emission standards.
- All non road mobile machinery (NRMM) to use ultra low sulphur tax-exempt diesel (ULSD) where available and be fitted with appropriate exhaust after-treatment from the approved list (**Section 7.2**).
- On-road vehicles to comply with the requirements of a possible future Low Emission Zone (LEZ) as a minimum (**Section 7.1**).
- Minimise movement of construction traffic around site (**Section 7.3**).
- Hard surfacing and effective cleaning of haul routes and appropriate speed limit around site (**Section 6.2.3**).

Demolition Works

- Use water as dust suppressant (**Sections 6.10 & 6.13**).
- Cutting equipment to use water as suppressant or suitable local extract ventilation (**Section 6.8**).
- Use enclosed chutes and covered skips (**Section 6.9**).
- Wrap building(s) to be demolished (**Section 6.13**).

Site Activities

- Minimise dust generating activities (**Sections 6.8, 6.9, 6.10 and 6.15**).
- Use water as dust suppressant where applicable (**Section 6.6**).
- Cover, seed or fence stockpiles to prevent wind whipping (**Section 6.7**).
- Re-vegetate earthworks and exposed areas (**Section 6.6**).
- If applicable, ensure concrete crusher or concrete batcher has permit to operate (**Sections 6.4 & 6.5**).

Implementation of the suggested mitigation measures above will help reduce the impact of the construction activities to medium, or even low risk.

5 Method Statement

A method statement should cover all phases of the development and take account of all contractors or sub-contractors. It should be submitted to the local planning authority (LPA) prior to any works being carried out and include a site evaluation (**see Section 4.1**) and a timetable of dust generating activities accompanied with proposed dust control measures. A Method Statement could be required by the LPA via a condition attached to the planning consent.

The content of a Method Statement will be determined by the site evaluation (**see Section 4.1**) but typical features to include are outlined below.

For all sites:

- summary of work to be carried out
- description of site layout and access – including proposed haul routes, location of site equipment including supply of water for damping down, source of water (wherever possible from dewatering or extraction), drainage and enclosed areas
- inventory and timetable of all dust generating activities
- list of all dust and emission control methods to be used
- details of any fuel stored on site
- identification of an authorised responsible person on-site for air quality. Ideally this person needs to have knowledge of pollution control and vehicle emissions;
- summary of monitoring protocols and agreed procedure of notification to the local authority nominated person(s)
- a site log book to record details and action taken in response to exceptional incidents or dust-causing episodes. It should also be used to record the results of routine site inspections.

Additional information for high risk sites

An approved list of all non-road mobile machinery (NRMM) to be used on site and appropriate after-treatment technology is available on the Energy Saving Trust website. See www.est.org.uk for details.

Details of the contractor's workforce training in areas such as health and safety, best practice methods, site housekeeping, reporting procedures and communication must be made available. All staff should have some training of on site pollution policy, perhaps as part of site induction training.

The specific site issues

A LPA may also make management of the following issues a condition of a method statement.

Asbestos

For sites with potentially asbestos-containing materials, a separate method statement will need to be produced by a specialist asbestos treatment contractor. An independent professional should approve the statement to ensure that no person at work or member of public is exposed to a harmful release of asbestos during works. Further information on asbestos control is provided in **Section 6.13** and the relevant regulations are outlined in **Appendix 3**.

Demolition

- developers must notify the Building Control Team of the relevant local authority of any building demolition works under sections 80 and 81 of the Building Act 1984. Demolition may commence after six weeks has elapsed from the submission of the notification or after the local authority has issued a counter notice, which will require certain tasks to be carried out
- developers should consider referring to the demolition protocol set up by the ICE (Institution of Civil Engineers) and CIWM (Institute of Waste Management)¹⁴. This protocol provides best practice on aspects such as building audits and use of recycled materials to be reused on site or elsewhere.

Contaminated Land

Many construction sites in London take place on brownfield sites and it may be appropriate to consider the following:

- inclusion of contaminated land issues in the method statement, in the context of identifying potential emissions to air and protecting human health
- providing details of specific control measures for sites with potential contaminated land issues
- developers should refer to legislation and procedures such as EPA 1990, Building Regulations Approved Document C, PPS23 and CLR11 for more information.

6 Dust and emissions control measures

Developers will need to ensure that all on-site contractors follow best practicable means (BPM) at all time to minimise dust and emissions. The following sub-sections identify the activities that are most likely to produce dust and outlines BPM. Some of these measures are summarised in the flow diagrams in **Section 4** and they are divided up according to the site risk. These measures are intended to be stringent but achievable and in-line with BPM to deal with the specific pollution problems facing London. All appropriate measures should be included in the method statement (**Section 5**).

6.1 Pre-site preparation

For all sites with areas of open ground that are close to sensitive receptors, developers should follow best practice to prevent dust and other pollutant emissions from being carried outside the boundary.

● **Low Risk**

- Machinery, fuel and chemical storage and dust generating activities should not be located close to boundaries and sensitive receptors if at all possible.
- Erect effective barriers around dusty activities or the site boundary.

● ● **Medium Risk and High Risk**

- As for low risk sites.
- Erect solid barriers to site boundary.

6.2 Haul routes

6.2.1 *Surface of roads*

Unpaved haul routes can account for a significant proportion of fugitive dust emissions, especially in dry or windy conditions, when the generation of dust through the movement of vehicles is exacerbated. It is recommended that to comply with good practice, developers should ensure that hard surfaces or paving are used for all haul routes, even if routes are temporary.

● **Low Risk**

- Use consolidated surfaces on roads near to residential areas.

● **Medium Risk**

- As for low risk sites
- Hard surface all major haul routes through the site (e.g. use recycled rubber blocks, concrete blocks or tarmac).
- Regularly inspect haul routes for integrity and repair if required.
- When the haul route changes, re-use surface where possible.

- **High Risk**

- As for medium risk sites. In addition, lay roads to a camber to prevent puddles.

6.2.2 *Damping down*

Developers will need to wash or damp down haul routes both within and outside the site. This is particularly important for sites close to residential properties or other sensitive receptors. Developers should consider the environmental and economic benefits from the use of groundwater sources on site, as opposed to bringing drinking water onto site for the purpose of dust suppression. Where possible the source of water should be sustainable to maximise use and re-use of this resource. For example, water produced from dewatering can be used on site, as achieved as part of the Channel Tunnel Rail Link (CTRL) contract. The majority of water that is generated from dewatering is discharged into watercourses or soakaways. Under the Water Act 2003, dewatering processes now require an Abstraction Licence to ensure appropriate environmental management¹⁵.

In addition, the use of flocculants or binders may be warranted in certain circumstances to reduce the volume of water needing to be used.

- **Low Risk**

- Use agreed wet cleaning methods or mechanical road sweepers on all roads during periods of dry weather.
- Clean road edges and pavements using agreed wet cleaning methods.

- **Medium Risk**

- As for low risk sites.
- Use agreed wet cleaning methods or mechanical road sweepers on all roads at least once a day or consider using fixed or mobile sprinkler systems.
- Provide hardstanding areas for vehicles and regularly inspect and clean these areas.

- **High Risk**

- As for medium risk sites.
- Use fixed or mobile sprinkler systems to clean roads at least once a day.
- Where possible use sustainable sources of water, such as from dewatering or extraction.
- Contact the Environment Agency to recycle any collected material or run-off water - according to legal requirements.
- Provide hardstanding areas for vehicles and regularly inspect and clean these areas.

Consider requiring contractors to meet ENCAMS standard for detritus grading (e.g., Grade B)¹⁶ - this means that dust or debris deposited on public highways has to be removed.

6.2.3 Vehicles

All developers should carry out the following controls to reduce dust and particulates associated with vehicles - such as that from exhaust emissions, the contact of tyres on the road surface or dust blowing from materials carried,:

- **Low Risk**
 - All vehicles should switch off engines - no idling.
 - Clean or wash all vehicles effectively before they leave a site if there is a risk of affecting nearby sensitive receptors.
 - All loads entering and leaving site to be covered.
- **Medium Risk**
 - As for low risk sites.
 - Wheel wash vehicles before they leave a site.
 - Hard surface haul routes and clean them effectively¹⁷.
 - Impose an appropriate speed limit around site.
- **High Risk**
 - As for low and medium risk sites.
 - Fixed wheel and/or vehicle washing at site exit.
 - Use fixed or mobile sprinkler systems to clean internal and external roads at least once a day.
 - More information on controlling PM₁₀ emissions from vehicle exhaust is provided in **Section 7**.

6.3 Site entrances/exits

Developers should employ the following control measures to help prevent dust being spread outside the site boundary by site vehicles at entrances and exits.

- **Low Risk**
 - No extra control measures required if there are no nearby sensitive receptors.
 - Wash or clean all vehicles effectively before leaving the site if it is close to sensitive receptors. Ideally there should be a paved area between the wheel wash and before the public road.
- **Medium Risk**
 - As for low risk sites.

- Provide a control zone around the site boundary to protect sensitive receptors (this could include an area of hardstanding).
- Provide effective vehicle cleaning and specific wheel-washing facilities at all exits; with hose pipes, adequate water supply and pressure and mechanical wheel spinners or brushes.

● **High Risk**

- As for medium risk sites.
- Put in place fixed wheel washing at all exits as well as procedures for effective cleaning and inspection of vehicles, which should include total vehicle washing and ticketing of vehicles.
- Vehicles carrying dusty materials should be securely covered before leaving the site.
- Enter all information, of vehicles entering/leaving site, in a log book.

6.4 Mobile crushing plant

This section only applies to construction sites that will operate mobile crushing plant at some point. This is an inherently dusty activity and will often be on sites normally classed as medium or high risk.

- Notify the local authority if a crusher is to be used as it has a duty to inspect the process. Mobile crushing plants are authorised as Part B processes, even if they are only temporary.
- Keep a copy of the permit on-site and adhere to the conditions therein at all times.
- Refer to Process Guidance note PG 3/16 (04)¹² and use best available techniques (BAT) according to the guidance at all times (see **Appendix 7**).

6.5 Concrete batching

As for mobile crushing plants, construction sites with concrete batching plants will often be categorised as medium or high risk.

Developers following this guidance should treat such plant as authorised Part B processes, even if temporary, and employ the same level of best practice as indicated below. The local authority should be notified if a concrete batcher is to be used on site:

- Refer to Process Guidance note PG 3/1 (04)¹² and carry out BAT (see **Appendix 7**).
- Wherever possible, these processes should be totally enclosed.

6.6 Excavation and earthworks

Excavation and earthwork activities can be a potential source of dust outside the site if they are not properly controlled. If these activities are

essential, then developers need to act to minimise dust disturbance as much as possible.

● **Low Risk**

- All dusty activities should be damped down, especially during dry weather.
- Temporarily cover earthworks if possible.
- Minimise drop heights to control the fall of materials.

● ● **Medium and High Risk**

- As for low risk sites.
- Re-vegetate earthworks and other exposed areas to stabilise surfaces.
- Only remove secure covers in small areas during work and not all at once.
- Use hessian, mulches or tackifiers where it is not possible to re-vegetate or cover with topsoil.

6.7 Stockpiles and storage mounds

Developers should avoid the use of long-term stockpiles on site wherever possible unless it performs the function of visual or noise screening. If necessary, the following measures should be in place:

● **Low Risk**

- Make sure that stockpiles exist for the shortest possible time.

● **Medium Risk**

- As for low risk sites.
- Do not build steep sided stockpiles or mounds or those that have sharp changes in shape.
- Whenever possible keep stockpiles or mounds away from the site boundary, sensitive receptors, watercourses and surface drains.
- Wherever possible, enclose stockpiles or keep them securely sheeted.

● **High Risk**

- As for low and medium risk sites.
- Take into account the predominant wind direction when siting stockpiles to reduce the likelihood of affecting sensitive receptors.
- Seed, re-vegetate or turf long term stockpiles to stabilise surfaces or use surface binding agents that have been approved by the Environment Agency.
- Re-use hard core material where possible to avoid unnecessary vehicle trips.

- Erect fences or use windbreaks such as trees, hedges and earth-banks of similar height and size to the stockpile to act as wind barriers and keep these clean using agreed wet methods.
- Store fine or powdery material (under 3mm in size) inside buildings or enclosures.
- Contact the Environment Agency if you need an exemption to stockpile waste material, whose disposal is subject to the Waste Management Licensing Regulations (WMLR), 1994. The treatment or ultimate disposal of this material is subject to the regulations.

6.8 Cutting, grinding and sawing

Ideally, these activities should not be conducted on site and pre-fabricated material should be brought in where possible. In cases, where such work must take place, then the following techniques should be followed:

A simple method to reduce dust emissions when cutting or grinding

This method is suitable for all sizes of demolition or construction sites. When materials, such as concrete slabs or bricks, are cut with a power tool without extraction or suppression, a second worker can pour water from a plastic bottle over the material as it is being cut. This greatly reduces the amount of dust generated and can stop the occurrence of a statutory nuisance.

● Low Risk

- All equipment should use water suppressant or suitable local exhaust ventilation systems.

● ● Medium and High Risk

- Use dust extraction techniques where available.
- All other equipment should be fitted with water suppressant systems.
- Use local exhaust ventilation.
- Service all fans and filters regularly to ensure they are properly maintained.

6.9 Chutes and skips

● ● Low and Medium Risk

- Securely cover skips.
- Minimise drop heights to control the fall of materials.
- Regularly damp down surfaces with water.

● High Risk

- As for low and medium risk sites.
- Completely enclose skips whenever possible.
- Hard surface areas where skips are to be stored.

- Reduce drop heights by using variable height conveyors or chutes.

6.10 Scabbling

Scabbling is the process of grinding concrete using a machine tipped with steel or carbide material to rapidly pound it. The following measures should be in place **at all sites** to comply with BPM:

- Pre-wash work surfaces.
- Screen off work areas.
- Vacuum up all dusty residue rather than sweeping away.

6.11 Waste disposal/burning

Previous Government best-practice documents¹⁷ state that under the Clean Air Act 1993, bonfires are not recommended on site and if unavoidable, they should be supervised at all times. However, it is recognised across London that local authorities prefer to set conditions that prevent any bonfires on site. Taking into account the Clean Air Act 1993 and nuisance legislation (Environmental Protection Act 1990), this Best Practice Guidance recommends that:

- No burning of any material is permitted on site.
- All excess material should not be wasted, but used or safely removed from site according to appropriate legislation.

● High Risk

- In addition to the above, the developer should produce a waste or recycling plan following guidance from the Mayor's SPG on Sustainable Design and Construction¹⁸. Further information on waste plans is provided on the Environment Agency website or in **Appendix 2**. The Environment Agency suggests that a waste plan includes the following best practice procedures:
 - Identify the waste types that are likely to be produced and aim to reduce the amount of waste as much as possible, through identifying routes to reuse or recycle materials.
 - Control access to storage areas to minimise risk of theft or damage.
 - Set up a dedicated store for timber, from which workers can re-use supplies.
 - Store any materials away from sensitive locations in fenced off areas.
 - Label all waste storage and skips, detailing the type of waste.
 - Employ a just-in-time policy to deliver materials in order to reduce the storage time on site.
 - Consider using recycled materials and recycle any materials used on site rather than disposing of them (including timber, aggregates, soil, tarmac, bricks, masonry, concrete and glass). CIRIA provides lists of recycled materials that companies will accept.

- If practicable, remove materials for recycling from buildings prior to demolition or from demolition spoil.

6.12 Dealing with spillages

For all sites, the following measures should be followed:

- use bunded areas wherever practicable
- regularly inspect the site area for spillages
- have spillage kits readily available
- clean spillages using agreed wet handling methods
- vacuum or sweep regularly to prevent the build up of fine waste dust material, which is spilled on the site and is designated as waste that is no longer fit for use should be dealt with in accordance with the Waste Management Licensing Regulations (WMLR), 1994
- inform the Environment Agency, London Fire and Emergency Planning Authority (LFEPA) or the Health Protection Agency (HPA) if harmful substances are spilled.

More information is provided by the Environment Agency in Pollution Prevention Guideline 6 - see **Appendix 3**.

6.13 Demolition activities

Potential dust hazards can be assessed according to BS 6187: Code of Practice for Demolition¹⁹, which includes all aspects of project development and management from demolition techniques to re-using or recycling materials. The demolition of buildings may result in a site being classified as **medium** or **high** risk during this activity.

Any asbestos must be dealt with by a registered contractor at all times and removed according to appropriate regulations (**see Appendix 3**) and approved codes of practice/HSE guidance such as HSG248²⁰ and MDHS100²¹. Developers must carry out a Type 3 asbestos survey and undertake the following tasks:

- notify the Health and Safety Executive of any work
- always employ competent and licensed contractors
- clearly identify the location of asbestos containing materials before starting work.
- put in place procedures to sample and analyse suspect materials
- carry out independent air sampling to ensure standards are met
- dispose of asbestos-containing materials to licensed waste sites according to HSE guidelines before the demolition company is given access.

Other examples of best practice in demolition:

- sheet and screen buildings with suitable material and where possible strip inside buildings before demolition begins
- ensure that a specialist contractor removes any asbestos before demolition (**see section 6.14**)
- materials should be removed from site as soon as possible. If stored, techniques covered in **section 6.7** should be followed
- avoid explosive blasting where possible and consider using appropriate manual or mechanical alternatives
- bag and remove any biological debris or damp down before demolition.

Developers should refer to Sections 80-82 of the Building Act 1984 and the ICE Demolition Protocol.

6.14 Hazardous or contaminated materials

Under the Control of Substances Hazardous to Health (COSHH) Regulations, 2002, developers must ensure that they take into account risks to the workforce from exposure to any harmful substances generated by work activities. Construction sites are often associated with activities that emit volatile organic compounds (VOCs), such as use of paints, adhesives, bitumen products and concrete and timber treatments. Emphasis should be placed on preventing or reducing emissions at source and where this is not possible personal protective equipment may be appropriate.

Developers should employ similar techniques according to appropriate legislation (**Appendix 3**) and low emission products, which comply with the new EU Paints Directive²², should be used whenever possible.

In addition, guidance is available to prevent the contamination of water courses from construction sites, such as CIRIA's documents C648²³ and C532²⁴.

6.15 Specific site activities

Other activities, specific to some demolition and construction sites, also have the potential to generate dust without proper control. The Best Practice Method for each activity is outlined below:

Sand, Grit and Shot Blasting

- Use agreed wet processes, sheet areas to contain dust and use silica-free material.

Planing and sanding

- Use fans and/or filters, dust suppression techniques and water sprays.

Fitting out

- Fit all machinery for activities such as plastering, sanding or rendering with dust suppression/collection equipment.
- Vacuum all waste material.

Welding and soldering

- Follow control measures in HSE guidance notes EH54 and EH55.

Tarmac laying and use of bitumen

- Do not overheat bitumen and cover pots.
- Use great care in all processes to prevent spillages and extinguish any accidental fires immediately.

7 Emission controls for vehicles and plant

Emissions from vehicles associated with construction sites can significantly add to levels of local air pollution, so it is important that best practical means of reducing vehicle emissions are adopted.

It is particularly important to note that diesel off-road vehicles and plant (known as non-road mobile machinery, NRMM) are not currently subject to as tight controls as road vehicles. Although they only make up a small proportion of total vehicles, emissions of oxides of nitrogen (NO_x) and particulate matter (PM) can be significant. Estimates in 1999 showed that UK NO_x emissions from diesel NRMM were 71 kilo tonnes (approximately 8 per cent of all road transport emissions) and 7 kilo tonnes of total PM emissions (16 per cent of road transport emissions)²⁵. A study for the EU estimated that off-road machinery accounted for approximately one third of PM_{2.5} emissions from mobile sources in 2000; proportionally equivalent to that from passenger cars. The report forecasts this proportion to rise to 40 per cent by 2020²⁶.

It is becoming more common for London local planning authorities to specify exhaust emission controls for NRMM for large, high profile demolition and construction sites. In addition, findings from the PRECIS working group showed that there was a case for early implementation of new European standards to control emissions from them. This Best Practice Guidance is committed to achieve a consistent approach across London by recommending minimum standards for both on-road and off-road vehicles associated with construction sites in London. These standards are explained in more detail below.

7.1 On-road vehicles

● Low Risk

If the London Low Emission Zone is implemented in 2008, then all HGVs with a gross vehicles weight over 3.5 tonnes and buses and coaches operating in London will need to meet the proposed emission standards. Up to date information regarding the Low Emission Zone can be found on the TfL website - www.tfl.gov.uk. In summary, all heavy goods vehicles will need to meet Euro III PM emissions, as a minimum, in 2008.

● ● Medium and High Risk

Developers can voluntarily apply tighter emission standards to their vehicles even if a low emission zone is implemented in 2008. This arrangement could be of benefit at sensitive locations and aid negotiations with the local planning authority (LPA) regarding operations on site.

7.2 Off-road vehicles and plant

Developers can specify tax-exempt 'red' diesel with a sulphur content equivalent to ultra low sulphur diesel (ultra low sulphur diesel means fuel meeting the specification within EN590:2004). This measure will automatically reduce particulate emissions by 30 per cent. In addition to this, fitting suitable after treatment devices can reduce the remaining particles by at least 85 per cent. As fine particles are of great concern to health this is, therefore, a very effective way of reducing any health impacts to workers and sensitive receptors. For example, studies in the US have shown that workers and residents near construction sites, where NRMM was not fitted with particulate filters, were exposed to PM_{2.5} exposure rates up to 16 times higher than at the site boundary. Similar results have also been seen in the UK²⁷.

The use of exhaust after-treatment technologies is well documented over the last 30 years, particularly in other European countries such as Sweden and Switzerland where it is already a requirement to fit NRMM with exhaust emission controls. In Boston, USA, 200 pieces of plant were retrofitted with emission controls for the Big Dig project. A comprehensive range of exhaust after treatment systems (as a retrofit or as original equipment option) are now available for NRMM operating in London. As part of the approval process, the retrofit supplier has to offer a comprehensive warranty package, details of which can be found in the EST certification scheme rules on www.est.org.uk Details of emission controls for NRMM are given below:

- ● **Low and Medium Risk**
 - All NRMM should use fuel equivalent to ultra low sulphur diesel (ULSD), especially where a bunkered fuel supply is available.

- **High Risk**
 - As for low and medium risk sites.
 - Grant access for an officer from the local authority or conformity inspector and provide a safe area to test NRMM if needed.
 - All NRMM should comply with either the current or immediately previous EU Directive Staged Emission Standards (97/68/EC, 2002/88/EC, 2004/26/EC); now transposed into UK regulations²⁸. As new emission standards are introduced the acceptable standards will be updated to the new current and immediately previous standard.
 - NRMM with power outputs of over 37kW should be fitted with suitable after-treatment devices stated on the approved list managed by the Energy Saving Trust. The devices included on this list conform to a filtration efficiency of over 85 per cent (load/duty cycle

permitting). This requirement will start from the date that the accreditation system is in operation (see Note (a)).

- The ongoing conformity of plant retrofitted with suitable after-treatment devices, to a defined performance standard, should be ensured through a programme of on-site checks.

Note (a) – Details of appropriate types of machinery suitable for after-treatment and accredited after-treatment technologies can be found on the Energy Saving Trust website – www.est.org.uk.

7.3 Additional plant and vehicle controls

In addition to the emission standards specified above, further measures should be put in place to reduce exhaust emissions and these are listed below. In addition to local air pollutants, carbon dioxide is also emitted from vehicle exhausts. As it is a key gas linked to climate change, controls should be put in place to limit emissions; these controls will also help developers reduce fuel costs. Detailed help and advice is available on the Energy Saving Trust's website (www.est.gov.uk).

● Low Risk

- No vehicles or plant will be left idling unnecessarily.
- NRMM (vehicles and plant) should be well maintained. Should any emissions of dark smoke occur (except during start up) then the relevant machinery should be stopped immediately and any problem rectified before being used.
- Engines and exhaust systems should be regularly serviced according to manufacturer's recommendations and maintained to meet statutory limits/opacity tests.
- All vehicles should hold current MOT certificates where required.
- Vehicle exhausts should be directed away from the ground and positioned so they are not directed at site entrances.
- Locate plant away from the boundaries close to residential areas.

● Medium Risk

- As for low risk sites.
- Reduce the number of vehicle movements through better planning. Consider using consolidation centres to ensure that only the materials needed for the job access the site.
- Set an appropriate speed limit on haul routes.
- Clearly label all vehicles associated with the contract.

● High Risk

- As for medium risk sites.
- Where works on site occur close to residential or other sensitive receptors near the site boundary, non-essential vehicles and machinery should not enter these areas.
- Clearly label all vehicles associated with the contract.
- Control queuing or parking of vehicles outside the site, both during and before the site opens.
- Avoid use of diesel or petrol powered generators by using mains electricity or battery powered equipment where possible and if safety concerns can be overcome.
- Encourage developers to use consolidation centres to manage site deliveries. This will help reduce time wasted searching for materials and the number of vehicles entering the site, and will have both congestion and emission benefits. Details of the London Construction Consolidation Centre can be found in the draft London Freight Plan, available at www.tfl.gov.uk.

7.4 Use of rivers, canals or railways

Where construction sites are located near to waterways or railways it may be feasible for construction materials to be delivered or removed from the site using these means, rather than by road. The obvious benefit is that it will reduce the number of trips made by HGVs on local roads, therefore reducing local emissions and disturbance to sensitive receptors. This option is rarely used in London, but developers following this guidance, should try to make use of the waterways wherever possible or investigate if there is spare capacity on nearby railways. The Mayor's draft Freight Plan also seeks to encourage the use of waterways and rail in place of roads whenever practicable.

A good example has been set by the London Borough of Greenwich. It set a planning condition to use the River Thames for construction materials transported to the Millennium Dome site on the Greenwich Peninsula.

8 Site monitoring

8.1 Site monitoring protocols

If best practicable means identified in **Sections 6 and 7** are followed correctly, then formation of dust and harmful emissions from construction sites should be minimised as much as possible. However, continuous site monitoring is still an important way of helping developers manage dust and PM₁₀ emissions from construction and demolition. The location of a construction site could impact on a local area to the extent where air quality is worsened within an existing air quality management area (AQMA) or is worsened to the extent where an AQMA needs to be declared by the relevant local authority.

This section specifies air quality monitoring protocols that should be followed according to the identified risk of the site. More information on the available measurement devices is included in **Appendix 5**. Monitoring of air pollution from all demolition and construction sites should be undertaken. This will vary from visual assessments for low risk sites to the installation of real time automatic monitors for PM₁₀ for high risk sites. On certain sites it may be appropriate to determine the baseline situation before construction begins. The local planning authority (LPA) will provide advice on the appropriate air quality monitoring procedure and timescale - the requirements of which will be determined on a case by case basis.

Where the LPA requires automatic real-time air quality monitoring to be carried out by the developer, two frequently used procedures are:

- monitoring along a transect (straight line) across the construction site, set up in the direction of the prevailing wind. This will allow the developer to take into account background levels to determine the relative contribution of air quality and dust emissions from the construction site. Prior monitoring of background air quality may not be needed in this case
- monitoring to take place close to sensitive receptors to assess any impact at these locations.

● Low Risk

- Employ best practice methods at all times.
- Take into account the impact of air quality and dust on occupational exposure standards to minimise worker exposure and breaches of air quality objectives that may occur outside the site boundary, such as by visual assessment.
- Keep an accurate log of complaints from the public.

● Medium Risk

- As for low risk sites.
- Determine the prevailing wind direction across the site using data from a nearby weather station. Permanent weather stations are only operated at few locations in and around London. Ideally a minimum of 12 months data should be used.
- If measuring along a transect:
 - Set up a transect across the site according to the direction of the prevailing wind.
 - Operate a minimum of two automatic particulate monitors to measure PM₁₀ levels at either end of the transect - either inside or outside the site boundary. These instruments should provide data that can be downloaded in real-time by the local authority.
- If monitoring at sensitive receptors:
 - Identify which location(s) need to be monitored and set up an automatic particulate monitor at each of these to measure representative PM₁₀ levels. These instruments should provide data that can be downloaded in real-time by the local authority.
- If relevant, supplement monitoring with hand held monitors to get on the spot readings at selected points, such as close to sensitive receptors.
- Consider also monitoring dust deposition and soiling rates as these can be used to indicate nuisance (**see Appendix 4**).

● High Risk

- As for medium risk sites.
- Set a site action level see **Section 8.2**.
- Determine prevailing wind direction, as for medium risk sites, or by setting up a weather station on site to measure local wind direction and speed.
- If measuring along a transect:
 - Set up a transect across the site according to the direction of the prevailing wind.
 - Operate a minimum of two automatic particulate monitors to measure PM₁₀ levels at either end of the transect - either inside or outside the site boundary. These instruments should provide data that can be downloaded in real-time by the local authority.
- The LPA may also require monitoring at sensitive receptors, if this is the case:
 - Identify which location(s) need to be monitored and set up an automatic particulate monitor at each of these to measure representative PM₁₀ levels. These instruments should provide data that can be downloaded in real-time by the local authority.

- If applicable, supplement with low cost automatic monitors or hand-held monitors, particularly focusing on any sensitive locations such as schools.
- Carry out dust deposition and soiling rate assessments following recommended procedures (see **Appendix 4**).
- Carry out a visual inspection of site activities, dust controls and site conditions and record in a daily dust log.
- Identify a responsible person on-site for dust monitoring who can access real-time PM₁₀ data from automatic monitors (e.g., at hourly or 15 minute intervals). Ensure that adequate quality assurance/quality control is in place.
- Agree a procedure to notify the local authority, so that immediate and appropriate measures can be put in place to rectify any problem. Alert mechanisms could include email, texts or alarm systems.
- Set up 24-hour phone hotlines so that residents can complain about high dust or PM₁₀ levels directly to the developer. Consider circulating summaries of monitoring results to the local community.

Site monitoring example: Heathrow T5

Air quality is continuously monitored at seven automatic air quality monitoring stations located around the T5 construction site. PM₁₀ concentrations are measured at all locations, PM_{2.5} and NO_x are measured at five of the sites and CO, SO₂, O₃ and met. data are collected at one location (see map). Dust soiling rates are also monitored using the glass slide method at 19 locations, close to potentially sensitive receptors. Monitoring began 18 months prior to the commencement of the construction works to determine the background air quality and determine PM₁₀ response threshold levels and site-specific dust action levels. The T5 Project Team is responsible for ensuring that PM₁₀ concentrations remain below these thresholds or, if a response threshold is exceeded, implementing an action plan to reduce emissions.

Both air quality and dust monitoring data is disseminated to the relevant local authorities via a secure website. The database that stores the monitoring results also compares each measurement against the relative action level and the T5 Project team is alerted by an automated e-mail if any action level is exceeded.

8.2 Site action levels

It is common procedure in other countries to set a maximum action level for PM₁₀ concentrations at the boundary of a work site. For example, a limit of 150 µg/m³, as a one-hour average, is typically set downwind of hazardous waste sites in the USA. If this is exceeded, the developer should monitor upwind and if this concentration is greater than 100

$\mu\text{g}/\text{m}^3$ above background and there is visible dust outside the site, additional controls should be put in place, such as personal protection for workers or suspending work if levels do not decline. In Hong Kong, two limits are set for dust from construction sites - $260 \mu\text{g}/\text{m}^3$ over 24 hours (where the baseline is $200 \mu\text{g}/\text{m}^3$ or above) and $500 \mu\text{g}/\text{m}^3$ over 1 hour (where the baseline is $384 \mu\text{g}/\text{m}^3$ or above). The one hour limit is designed to prevent any complaints.

The London borough of Greenwich enforced a site action level of $125 \mu\text{g}/\text{m}^3$, as a 15 minutes average, during the construction of the New Millennium Experience and the Greenwich Millennium Village. This action level was successful in promoting best practice and no complaints of dust emissions were received by the local authority.

Based on these procedures, this document recommends that a site action limit should be set, based on the risk assessment and background PM_{10} level and the LPA should agree this in advance. For example, a minimum site action is recommended to be **$250 \mu\text{g}/\text{m}^3$ over 15 minutes (or $200 \mu\text{g}/\text{m}^3$ for TEOM measurement)** - especially important for high-risk sites. If this level is breached it may indicate that best practice is not being achieved.

Developers should check that, where the site action level is at risk of being exceeded, best practice is in place as this could be used as a defence from prosecution under the S.80 of the Environmental Protection Act 1990.

Where the site action level is being significantly breached developers should stop work whilst ensuring that best practice measures are in place before restarting. It should be noted that local authorities may use breaches of site action levels as a basis for making a site visit and should use all powers at their disposal to prevent statutory nuisance.

Appendices

Appendix 1: Glossary

AQMA	Air Quality Management Area
AQS	Air Quality Strategy
BAT	Best Available Techniques
BPM	Best Practicable Means
BRE	Building Research Establishment
CIRIA	Construction Industry Research and Information Association
CIWM	Chartered Institute of Waste Management
COMEAP	Committee of Medical Effects of Air Pollution
COSHH	Control of Substances Hazardous to Health
CTRL	Channel Tunnel Rail Link
DEFRA	Department of Environment, Food and Rural Affairs
Dust	Particles with a diameter up to 75 µm
EA	Environment Agency
EPA 1990	Environmental Protection Act 1990
EST	Energy Saving Trust
GLA	Greater London Authority
GOL	Government Office for London
HGV	Heavy Goods Vehicle
HSE	Health and Safety Executive
HPA	Health Protection Agency
ICE	Institution of Civil Engineering
LAQM	Local Air Quality Management
LAPC	Local Air Pollution Control
LAPPC	Local Air Pollution and Prevention Control
LEV	local exhaust ventilation
LEZ	Low Emission Zone
LFEPA	London Fire and Emergency Planning Authority
LPA	Local Planning Authority
NO ₂	Nitrogen Dioxide
NO _x	Oxides of Nitrogen
NRMM	Non Road Mobile Machinery
ODPM	Office of Deputy Prime Minister
PG	Process Guidance
PM _{2.5}	Fine particles with a diameter less than 2.5 micrometres
PM ₁₀	Particles with a diameter less than 10 micrometres
PPS	Planning Policy Statement
QA/QC	Quality Assurance/Quality Control
RPC	Reduced Pollution Certificate
SAC	Special Area of Conservation (EU Habitats Directive)
SPA	Special Protection Area (EU Birds Directive)
SPG	Supplementary Planning Guidance
SSSI	Site of Special Scientific Interest

TEOM	Tapered Element Oscillating Monitor
TfL	Transport for London
TSP	Total Suspended Particles
ULSD	Ultra Low Sulphur Diesel (present UK specification is EN590:2004)
VOC	Volatile Organic Compounds

Appendix 2: Examples of planning conditions used in London

The following standard phrases are taken from legal agreements and section 106 agreements signed by London local planning authorities. These phrases are intended to show what conditions can be placed on developers, but it is by no means an exhaustive list. **If you choose to use these examples, take care to ensure the correct wording is used to reflect current policies:**

Provisions from the legal agreement that apply to the Thames Gateway Bridge

The legal agreement was signed by LB Barking and Dagenham, LB Greenwich, LB Newham, LB Redbridge and Transport for London. The following minimum provisions shall apply to vehicles used by contractors for the purposes of construction of the Thames Gateway Bridge, currently anticipated to be from 2008 to 2012:

- 1 All HGVs shall have minimum emissions standards equivalent to Euro III plus exhaust after treatment (duty cycle permitting) from start of construction and Euro IV by 2010;
- 2 All Non Road Mobile Machinery (NRMM) shall use ultra low sulphur diesel (ULSD);
- 3 All Non Road Mobile Machinery (NRMM) shall comply with either the current or next previous EU Directive Staged Emission Standards (97/68/EC, 2002/88/EC, 2004/26/EC);
- 4 All Non Road Mobile Machinery (NRMM) shall be fitted with Diesel Particulate Filters (DPF) or other exhaust after-treatment conforming to a defined and demonstrated filtration efficiency (load/duty cycle permitting); and
- 5 The ongoing conformity of plant retrofitted with exhaust after-treatment, to a defined performance standard, shall be ensured through a programme of on-site checks.

Example of a planning condition set by LB Newham for the Channel Tunnel Rail Link

All commercial road vehicles used on the construction project must meet the European Emission Standards (commonly known as Euro standards) of Euro 3 during any works that take place from the date of this consent and Euro 4 for any works that takes place from 1 January 2008. In the event of any new European Emission Standards being introduced after 2006, the standards shall be applied to all road vehicles serving the construction project within a period of 2 years from the date of introduction contained within the relevant EU Directive.

All non-road mobile vehicles with compression ignition engines used within the site must comply with emission standards set in EC directive 97/68/EC. Vehicles must meet Stage II limits from the start of contract and from 1 January 2012, meet Stage IIIa and b emission limits.

Exemptions to the above standards (for road and non-road vehicles) may be granted for specialist equipment or for equipment with alternative emission reduction equipment or run on alternative fuels. Such exemptions will be applied for in writing to the LPA in advance of the use of such vehicles, detailing the reasons for the exemption being sought and clearly identifying the subject vehicles. Exemptions that are granted will be made in writing and such vehicles must not be used until written exemption has been received by the applicant.

No vehicles or plant to which the above emission standards apply shall be on site, at any time, whether in use or not, unless it complies with the above standards, without the prior written consent of the local planning authority.

Any diesel powered machines used on, or otherwise serving the site, must be run on ultra low sulphur diesel (also known as ULSD 'cleaner diesel' or 'green diesel'). "Ultra low sulphur diesel" means fuel meeting the specification within EN590:2004.

Reasons: To protect the amenity of future occupants and/or neighbours and with regard to policy EQ45 of the London Borough of Newham Unitary Development Plan (adopted June 2001).

*Examples of 106 agreement clauses set by LB Greenwich with regard to the Greenwich Peninsula Development
(Planning ref: 02/2903/O)*

DEED OF PLANNING OBLIGATION

18. Low Emission Zone

18.1 The Developer covenants with the Council:

- 18.1.1 at the same time as it submits the first application for residential/commercial development for approval of reserved matters to the Council in consultation with the GLA under condition number 53 of the Planning Permission to submit to the Council for approval details of the Low Emission Zone on the Land and of the Low Emission Zone Controls together with a programme for implementation of the Low Emission Zone and the Low Emission Zone Controls all within the terms set out in Schedule 6;

- 18.1.2 to implement the Low Emission Zone and the Low Emission Zone Controls on the respective parts of the Land in accordance with the details and the programme approved under Clause 18.1.1 to the reasonable satisfaction of the Council and thereafter keep implemented the Low Emission Zone and the Low Emission Zone Controls at all times until Completion of the Development to the reasonable satisfaction of the Council, subject to any variation of the Low Emission Zone and/or the Low Emission Zone Controls approved by the Council from time to time;
- 18.1.3 save for the heavy goods vehicles and construction vehicles referred to in Schedule 6 not later than 1 April 2010 (or such other date agreed by the Council) and thereafter at the dates for Periodic Review, to submit to the Council for approval a review of the operation of the Low Emission Zone, including the Low Emission Zone Controls over the preceding period and proposals for the following period and shall use all reasonable endeavours to obtain the Council's approval thereto.

The relevant schedule with regards to HGVs and the Greenwich Low Emission Zone

12. Heavy Goods Vehicles / Construction Vehicles
- 12.1 Through the operation of the Integrated Management System, MDL will use reasonable endeavours to achieve emission levels for HGV/Construction vehicles in accordance with the item 11.2 below.
- 12.2 MDL will use reasonable endeavours to achieve emission levels for HGV as follows:
- 12.3 80% vehicles achieving a minimum Euro 2 plus reduced pollution certificate up to 1 January 2007;
- 12.4 MDL will use the following measures:
- (a) prior to MDL's approval of a principal Contractor to start on site at any of the development plots (and/or infrastructure works), the principal Contractor will be required to submit his strategy to MDL for achieving the required Euro emission standards;
- (b) the principal Contractor will be required to monitor progress against his strategy referred to in Paragraph 3.1;
MDL will carry out a review of the HGV/Construction vehicle low emission zone measures and targets post Dome Arena opening with a view to achieving Euro 4 compliance by 1 January 2010.

DEED OF PLANNING OBLIGATION

- 35 Maximise use of the river Thames
- 35.1 The Developer covenants with the Council:
- 35.1.1 not later than the First Dwelling Implementation Date to submit to the Council for approval in consultation with TfL a strategy to maximise use of the River Thames where reasonably appropriate for the delivery of those construction materials to the Southern Land and removal of that

- construction waste from the Southern Land as listed in Schedule 3, during the construction of the Development;
- 35.1.2 before Implementation of any part of the Development on a Plot to submit to the Council for approval by the Council detailed measures to implement the strategy referred to in Clause 35.1.1 and to implement such measures in the carrying out of the part of the Development on the Plot.
- 35.2 The strategy shall be included in the Integrated Management System.
- 35.3 This Clause 35 is a Management Covenant except in relation to Clause 35.1.2 which is a Plot Covenant. similar facilities subject to the agreement of commercial terms. compliance by 1 January 2010.

The relevant schedule with regards to using the River Thames

RIVER USE/NON-ROAD USE

Any reference to MDL in this Schedule 2 shall, unless the context otherwise provides, mean the Developer in Clause 3 of this Agreement.

Any reference to AnSCO in this Schedule 2 shall, unless the context otherwise provides, mean the Developer in Clause 4 of this Agreement.

1. Through the operation of the Integrated Management System, the Developer will use reasonable endeavours to reduce road based construction traffic from levels predicted in the Environmental Statement. Maximising use of the River Thames will play a key role in achieving this objective but the Developer shall be entitled to have regard to the cost differential between river and road use.
2. The Developer will use reasonable endeavours to reduce the amount of construction materials transported by road to/from the Land (measured by weight and as a percentage of the total weight of materials transported) as follows:
 - 2.1 10% by the first Periodic Review (2 years);
 - 2.2 15% by the second Periodic Review (5 years);
 - 2.3 20% by the third Periodic Review (10 years);
 - 2.4 25% by the fourth Periodic Review (15 years); and
 - 2.5 30% by the fifth Periodic Review (20 years).
3. The Developer will use the following measures:
 - 3.1 Prior to the Developer's approval of a principal Contractor to start on site at any of the Plots (and/or associated infrastructure works), the principal Contractor will be required to submit its strategy to the Developer for evaluation and implementation of non-road transportation of materials to/from its site. The principal Contractor's strategy shall include procedures for increasing the amount of non-road transportation of construction materials to/from his site during his contract period.
 - 3.2 The principal Contractor will be required to monitor progress against the principal Contractor's strategy referred to in Paragraph 3.1. For example, at the Dates for Periodic Review referred to in Paragraph 2, the principal Contractor will be required by the Developer to confirm the proportion of

materials (measured by weight and as a percentage of the total weight of materials) transported (or intended to be transported) to/from the Land by river transport.

4. Details of the Hanson concrete supply operation at VDWT and the London Concrete supply operation will be provided to all relevant Contractors by the Developer. Both operations utilise non-road transportation to import bulk aggregate materials to their facilities - and will qualify for designation as non-road imported material. All relevant Contractors will be encouraged by the Developer to utilise these or similar facilities subject to the agreement of commercial terms. compliance by 1 January 2010.

Appendix 3: Relevant legislation and guidance

1 UK Acts of Parliament

This section provides a brief explanation of some of the major legislation and guidance that local authorities can use to control dust and emissions from construction and demolition sites. These are provided for information purposes and are not an authoritative statement of the law.

Environmental Protection Act (EPA) 1990 and Pollution Prevention and Control (England and Wales) Regulations 2000

Part 1 of the EPA 1990 contains two methods of pollution control

- a Integrated Pollution Control (IPC) - regulation of the larger polluting processes (Part A) by the Environment Agency
- b Local Authority Integrated Pollution Prevention and Control (LA-IPPC) - Local authority regulation of industrial activities (Part A2), considers emissions to air, water (including discharge to sewers) and land
- c Local Authority Pollution and Prevention Control (LAPPC) - regulation of smaller, less polluting processes (Part B)
- d From 1 August 2000, regulation of processes has been transferred to the Pollution Prevention and Control (England and Wales) Regulations 2000. Certain activities relevant to construction sites are regulated as Part B processes and have their own process guidance (PG) and/or additional guidance notes, including:
 - Mobile Crushing and Screening Processes- PG 3/16 (04)- revised draft 2001
 - Quarry Processes (Aggregates)- PG 3/8 (96) - revised draft 2001
 - Blending, Packing, Loading and use of Bulk Cement- PG 3/1 (04)
 - Asbestos- PG 3/13 (95) and AQ 3(96)
 - Plaster Processes- PG 3/12 (95) - revised draft 2001
 - Lime Processes - PG 3/14 (95) - revised draft 2001
 - Cement Processes - AQ14 (92)
 - Mobile Plant AQ 9(92)

Part II makes provisions relating to the management of waste duty of care for its proper disposal, for example Part 2 33(c) states that a person shall not treat, keep or dispose of controlled waste in a manner likely to cause pollution of the environment or harm to human health. Part III of the Act allows local authorities to take action to abate statutory nuisances such as dust, steam, smell, fumes from construction site that is deemed prejudicial to health or a nuisance. Dark smoke emissions are dealt with separately under the Clean Air Act 1993.

Greater London Authority Act 1999

This Act set up the Greater London Authority and functional bodies (Transport for London, Metropolitan Police Authority, London Fire and Emergency Planning Authority and the London Development Agency). The GLA is a unique form of strategic citywide government. It is made up of a directly elected Mayor and a separately elected Assembly. The Mayor has an executive role, making decisions on behalf of the GLA. The Mayor has published his statutory strategies on transport, spatial development, economic development and the environment. They contain policies to improve London's economy, infrastructure and environment and the most relevant to this Best Practice Guidance are the London Plan, Mayor's Transport Strategy and Mayor's Air Quality Strategy.

Environment Act 1995 and Air Quality Regulations 2000

The Air Quality Strategy set standards and objectives for air pollutants under Part IV of the Environment Act 1995. Local authorities have a responsibility to carry out a process of Local Air Quality Management and work towards objectives set for seven pollutants in the Air Quality Regulations. Of these, the most relevant for construction sites is PM₁₀, for which a short term (24 hour) and long term (annual average) objective have been set.

Clean Air Act 1993

Under the Clean Air Act 1993, the burning of infected timber and waste is exempt in cases where transportation may have cross-infected wooden backed vehicles. However, emitting dark smoke from bonfires is an offence under this act.

Building Act 1984

Applies to demolition of buildings and requires prior notification to the local authority and production of a method statement before work begins. Sections 80-82 concern procedures to be carried out by the person who intends to undertake demolition. Under Section 80, the developer must notify Building Control at least 6 weeks before work begins. Demolition may commence after 6 weeks has elapsed from the submission of the notification or after the local authority has issued a counter notice, which will require certain tasks to be carried out.

Health and Safety at Work Act 1974

The purpose of this act is to secure the health, safety and welfare of persons at work and to protect against risk to other persons from these activities. Under this act the Health and Safety Executive (HSE) issue sets of guidance notes, the most relevant to construction activities include:

- Working with asbestos cement and board- HSG189/1, HSG 189/2

- Dust: general principles of protection-EH44
- Respirable crystalline silica-EH59
- Man-made mineral fibres-EH46
- Ventilation of the workplace-EH22
- Assessment of exposure to fumes from welding and allied processes-EH54
- The control of exposure to fumes from welding, brazing and similar processes-EH55
- Occupational Exposure Limits-EH40
 - Asbestos: exposure limits and measurements of airborne dust concentrations -EH10
- Asbestos 1988-HS13
- BS 6187:1982 Code of Practice for Demolition.

The following regulations and guidance are also important to consider when dealing with dust and emissions from construction sites:

Control of Substances Hazardous to Health Regulations (COSHH) 2002

These regulations apply to all “very toxic, toxic, harmful, corrosive or irritant” substances. This includes dust of any kind when present in the air. These regulations mean employers must protect their employees. This includes a requirement to comply with exposure limits in the HSE publication EH40, which is published annually (see Table 1 and 2 that relate to materials from construction).

Control of Asbestos in the Air Regulations 1990

All scheduled asbestos works that involve the “use of asbestos” must meet an emission limit to the air of 0.1mg/m³. These regulations require asbestos to be monitored at intervals of not less than 6 months.

Control of Asbestos at Work Regulations 2002

This regulation covers occupational exposure to asbestos by imposing duties on employers to protect employees who may be exposed to asbestos. HSE Guidance note EH10 provides exposure limits and information of the measurement of airborne dust concentrations.

Control of Lead at Work Regulations 2002

This regulation replaces the 1998 regulations and requires employers to assess risks from exposure to lead in the workplace and to take steps to prevent or reduce exposure.

The Control of Pollution (Special Waste) Regulations 1980 (amended 1988)

These regulations define a system to trace special or special waste from the point of origin to final disposal, including transfer, subdivision, and any other change.

Construction (Design and Management) Regulations 1994

These regulations are relevant to all stages and activities of construction and demolition work as they aim to improve the management and co-ordination of all health, safety and welfare aspects throughout construction projects to reduce the number of accidents.

Waste Management Licensing Regulations (WMLR) 1994. Schedule 3 and Special Waste Regulations 1996.

Procedures to manage contaminated and un-contaminated waste and deal with waste licenses.

The Non-Road Mobile Machinery (Emissions of Gaseous and Particulate Pollutants) Regulations 1999 and Amendment Regulations 2005

Transposes stringent requirements to reduce emissions from diesel engines of non-road mobile machinery in EU directives 97/68/EC, 2002/99/EC and 2004/26/EC. These regulations tighten the emission standards in two stages - Stage IIIA from 2006-8 and Stage IIIB from 2011-12 to reduce NO_x, HC and particulate emissions.

2 Planning Guidance

The London Plan

The Mayor is responsible for strategic planning in London. He has a wide range of duties and powers. The government has set out guidance and advice on the Mayor's planning duties and powers. His duties include producing a Spatial Development Strategy for London - called the London Plan - and keeping it under review. The London Plan replaces existing strategic guidance, it forms the development plan for each borough together with the borough's development plan documents, which themselves must be in "general conformity" with the London Plan.

The Greater London Authority (GLA) Act 1999 requires that the London Plan deals only with matters that are of strategic importance to Greater London. The required content of the London Plan is set out in a government guidance note (Circular 1/2000). The GLA Act also requires that the London Plan takes account of three crosscutting themes:

- The health of Londoners.
- Equality of opportunity.
- Its contribution to sustainable development in the UK.

The London Plan provides the framework for the Mayor to produce more detailed strategic guidance on issues which cannot be addressed in sufficient detail in the plan. To provide detailed advice on its policies, Supplementary Planning Guidance (SPG) and Best Practice Guidance (BPG) documents have been produced.

*Supplementary Planning Guidance
Sustainable design and construction*

This SPG has been produced to provide additional information to support the implementation of the London Plan - Policy 4B.6 relates to sustainable design and construction and sets the context for this SPG. This document cannot set new policy but it can be taken into account as a further material consideration so has weight as a formal supplement to the London Plan. The SPG is applicable to all building types and associated spaces, with specific information on different building types provided where relevant.

*The Town and Country Planning (Environmental Impact Assessment)
(England and Wales) Regulations 1999*

For major developments over certain thresholds (Schedule I and II applications), the developer must submit an environmental impact assessment (EIA) to the local authority before planning consent is granted. The EIA sets out the likely impacts on the environment of the proposed development (from all stages including demolition and construction) and must include measures to mitigate any significant negative effects.

*Planning and Policy Statement 23 (PPS23):
Planning and Pollution Control*

This guidance sets out the government's core policies on pollution control (air and water quality and contaminated land) with respect to land-use planning. PPS23 advises that air quality impacts arising from a development is capable of being a material planning consideration. Annex 1 Section 1.50 sets out cases where it is necessary to use planning conditions to control pollution, such as for construction and demolition phases or the need for planning agreements in situations where planning conditions are inappropriate.

*NCSA guidance 2006:
Development Control: Planning for Air Quality*

This new guidance provides a framework for air quality considerations to be included in the development control process and provides a new approach to addressing air quality impacts. The document aims to

improve communication between developers, planners and environmental health officers.

London Council's Guidance

This guidance provides robust technical advice for developers (their consultants) and local authority air quality officers, on how to assess planning applications that could have an impact on air quality. The procedures aim to provide a consistent approach for dealing with air quality and planning in London.

3 Other guidance

Model Procedures for the Management of Land Contamination (CLR 11)

The Environment Agency developed the model to provide the technical framework for applying a risk management process when dealing with land affected by contamination. The process involves identifying, making decisions on, and taking appropriate action to deal with land contamination in a way that is consistent with government policies and legislation within the UK.

Pollution Prevention Guidance notes (PPGs)

The Environment Agency, Scottish Environment Protection Agency (SEPA) and the Environment and Heritage Service in Northern Ireland have produced a range of Pollution Prevention Guidance notes (PPGs), which are targeted at a particular industrial sector or activity and gives advice on the law and good environmental practice. They include advice on oil and fuel storage, preventing pollution of water courses and managing fire water and major spillages.

These PPGs are available from either of the agencies as hard copies or directly from their websites.

Appendix 4 Standards and guidelines

UK Air quality objectives in the National Air Quality Strategy

Table 1 Air Quality Strategy Objectives in Air Quality Regulations

Pollutant	Air quality objective	Concentration measured as	Date
Fine particles (PM ₁₀)	No more than 35 days above 50 µg/m ³	Daily mean	31 Dec 04
	40 µg/m ³	Annual mean	31 Dec 04
	No more than 10 days above 50 µg/m ³	Daily mean	31 Dec 10*
	23 µg/m ³	Annual mean	31 Dec 10*
Nitrogen dioxide	No more than 18 hours above 200 µg/m ³	Hourly mean	31 Dec 05
	40 µg/m ³	Annual mean	31 Dec 05
Sulphur dioxide	No more than 24 hours above 350 µg/m ³	Hourly mean	31 Dec 04
	No more than 3 days above 125 µg/m ³	Daily mean	31 Dec 04
	No more than 35 times above 266 µg/m ³	15 minute mean	31 Dec 05
Carbon monoxide	Maximum 10 mg/m ³	Running 8 hour mean	31 Dec 03
Benzene	5 µg/m ³	Annual mean	31 Dec 10
1,3 butadiene	2.25 µg/m ³	Running annual mean	31 Dec 03
Lead	0.5 µg/m ³	Annual mean	31 Dec 04
	0.25 µg/m ³		31 Dec 08

*Not prescribed in regulations

Occupational health standards²⁹:

Table 2 Maximum Exposure Limits (MEL) used to enforce the Health and Safety at Work Act 1974 - substances that may cause most serious health effects for which “no adverse effect level” can be determined

Material	Long term MEL (8h TWA) mg/m ³
Hardwood dust	5
Softwood dust	5
Silica (Respirable crystalline)	0.3
Man-made mineral fibre	5

Table 3 Occupational Exposure Limits (OEL) - set at levels where there is no indication of risk to health of workers

Material	Fraction	Long term OEL (8h TWA) mg/m³
Calcium carbonate	Inhalable	10
	Respirable	4
Calcium silicate	Inhalable	10
	Respirable	4
Coal dust	Respirable	2
Emery	Inhalable	10
	Respirable	4
Gypsum	Inhalable	10
	Respirable	4
Limestone	Inhalable	10
	Respirable	4
Marble	Inhalable	10
	Respirable	4
Mica	Inhalable	10
	Respirable	4
Plaster of Paris	Inhalable	10
	Respirable	4
Portland Cement	Inhalable	10
	Respirable	4
Ground granulated blast furnace slag	Inhalable	10
	Respirable	4
Pulverised Fuel Ash	Inhalable	10
	Respirable	4
Silica (amorphous)	Inhalable	6
	Respirable	2.4
Silica (fused)	Respirable	0.08
Silicon carbide	Inhalable	10
	Respirable	4

Appendix 5: Air quality monitoring techniques

There are a wide range of sampling and detection methods available. Some of the main techniques are indicated below:

1 Automatic real-time point analyser methods

Provide high-resolution measurements (typically hourly or shorter time periods). In order to ensure that data is accurate and reliable, there needs to be a high standard of maintenance, calibration and QA/QC procedures in place. These types of monitors can measure different particulate fractions such as PM₁₀ and PM_{2.5} when fitted with designated inlet heads. Monitors such as TEOM or beta-attenuation analysers (with heated inlets) need to be corrected by a factor of 1.3, when comparing results with the AQS objectives, as these are based on a gravimetric standard.

2 Gravimetric monitoring

This monitoring method is considered to be the most accurate and produces concentrations equivalent to the EU reference samplers, which are used to set EU limit values. Such systems have designated inlet heads to measure different particulate fractions and a typical measurement is taken over 24 hours. The measurement system is time-consuming as filters need to be individually weighed and accurate filter weighing and conditioning facilities are required. This method cannot be used as a trigger system as it does not produce instantaneous readings.

3 Remote optical/long path analysers

These are relatively low-cost automatic analysers that have been developed specifically for portable or personal exposure applications. These tend to be battery or mains powered and use the light scattering principle to measure PM₁₀ and other particulate fractions.

4 Hand-held monitors

Although these types of monitors are not as accurate as automatic monitors and cannot be used for long term studies, they are ideal for walk-over surveys of construction sites as they provide real time or instantaneous dust readings (every second). Such monitors can be set up to measure different particle sizes and can be used to assess short term peaks and breaches of set limits.

In techniques 3 and 4, a factor is used to convert the measured number of particles in each size range to an overall mass concentration - which may not be accurate without a gravimetric filter backup.

In addition to the individual monitors, other site infrastructure is often required. This particularly refers to automatic monitors and can include equipment housing, air-cooling or heating systems, electrical systems, telephone lines or modems and air sample inlet systems.

Automatic monitoring equipment should have had some independent verification of performance, such as the Environment Agency’s MCERTS scheme. Further information on siting requirements and equipment suppliers is available on the National Air Quality Information Archive at www.airquality.co.uk.

5 Dust assessment

Approaches to measure the amount of dust deposited on a surface tend to focus on either determining the soiling of a surface by a change in its properties or determining the quantity of dust deposited by weight. These techniques are often used to determine nuisance and may be requested by a local authority in cases of complaint from sensitive receptors. Accepted methodologies include:

Deposit gauges - These are simple but accurate methods to measure nuisance dust. Dust is collected onto a horizontally mounted capture container or, in the case of a Directional Dust Gauge, into four vertical tubes aligned in different directions. The dust collected can also be analysed to determine its composition.

Deposited dust guidelines for urban areas (based on monthly mean dustfall)³⁰

Table 2 Examples of dust guideline levels

British standard gauge (mg/m ² /d)		Dry Frisbee gauge equiv (mg/m ² /d)	
Complaints possible (90th percentile)	Complaints likely (95th percentile)	Complaints possible	Complaints likely
150	190	200	260

Soiling Rate Measurement: This is used to determine changes in the soiling rates of surface over a period of time. One method is the Sticky Pad system, which measures the soiling on a white adhesive surface over a known period. This provides a measurement of the deposition (as percentage Effective Area Coverage per day) using a reflectometer. Alternatively, glass slides can be used which are exposed for a week before returning to the laboratory to measure the change in the gloss of

the surface. Results are measured in soiling units (su) per week, whereby 20 su/week reflects a dusty activity.

Soiling rates

1 Sticky pads

Possible complaints: 0.5 per cent Effective Area Coverage (EAC)/day (34 $\mu\text{g}/\text{m}^3$)

Serious complaints: 5 per cent EAC/day (280 $\mu\text{g}/\text{m}^3$)³¹

2 Glass slides

A level of 20-25 su/week, averaged over 4 weeks appears to be the boundary between acceptable and unacceptable dust levels³²

Appendix 6: Local Authority Pollution Prevention and Control

The tables below outline relevant best available techniques (BAT) according to Defra's Process Guidance Notes.

Mobile Crushing Plant

Sources of dust	Control technique
Loading and unloading of materials	Containment
	Suppression
	Reduce drop heights (through variable height conveyors or chutes)
Double handling transfer points	Site and process design
Stockpiles	Wind design management through fencing, bunding etc
	Suppression
	Covering
Crushing, grinding, screening	Containment
	Suppression
	Dust arrestment
Conveyors and transfer	Containment (wind boards)
	Appropriate siting away from receptors
Blending and packing	Containment
	Reduce drop height
	Dust arrestment (bag or cartridge filters)
External operations	Appropriate siting
	Wind design management
Vehicles	Wheel and under body washing

Taken from Process Guidance Note 3/16 (04)

Concrete batching activities

Sources of dust	Control technique
Loading and unloading of materials	Containment
• transfer of aggregate to bins	Suppression (ring spray bars)
• transfer of dry batch to mixer	Reduce drop heights (through variable height conveyors or chutes)
• transfer of dry batch to lorry	Dust arrestment (loading area) using bag or cartridge filters
Double handling transfer points	Site and process design
Delivery from road tanker to silo	Various techniques
Silos	Dust arrestment (bag or cartridge filters)
Aggregate stockpiles	Wind design management through fencing, bunding etc Suppression (water and/or suppressants, well positioned spray guns and sufficient coverage by sprays) Covering
Conveyors and transfer	Containment (wind boards) Reduce drop heights Appropriate siting away from receptors
Blending and packing	Containment Designated areas Reduce drop height Dust arrestment (bag or cartridge filters)
External operations	Appropriate siting Wind design management
Vehicles	Wheel and under body washing Exhausts that do not point vertically down

Taken from Process Guidance Note 3/1 (04)

Appendix 7: Developments Referable to the Mayor

Borough councils in Greater London must refer to the Mayor any planning applications received after 3 July 2000, which meet one or more of the following criteria³³.

New Housing

Any development comprising or including over 500 units (houses or flats); or comprising or including houses or flats and occupying more than 10 hectares. (But all 'departure' cases of 150 units or more will be referable, see below.)

Other New Uses

(eg retail, industry, offices, mixed uses)

- **30,000 sq.m.** in the City of London.
- **20,000 sq.m.** in the rest of central London.
- **15,000 sq.m.** outside central London

New Tall Buildings

- **25m** adjacent to the River Thames.
- **75m** anywhere else in the City of London.
- **30m** elsewhere.

Existing Tall Buildings

- Increase of 15m, if then above the appropriate threshold for new tall buildings.

Mining

- **10 hectares** (sand and gravel extraction sites).

Waste

- with capacity for more than **50,000 tonnes** per annum (treating, storing, processing or disposing).

Transport

- Aircraft runway.
- Heliport (including floating or rooftop).
- Air passenger terminal at an airport.
- Existing air passenger terminal capacity increase of 500,000 passengers p.a.
- Railway station.
- Tramway, underground, surface or elevated railway, cable car.
- Bus or coach station.
- Storage or distribution (Use Class B8) occupying more than 4 hectares.
- River Thames crossing (over or under).
- Thames passenger pier.

Existing housing³⁴

- Any development involving the loss of 200 units (houses or flats) (irrespective of any new units) or prejudices the use of more than **4 hectares** of land used for housing.

Existing B1 Business, B2 General Industrial, B8 Storage or Distribution²

- Any development which prejudices the use of more than **4 hectares** for any such use.

Playing Fields²

- Any development which prejudices the use of more than **2 hectares**.

Green Belt/MOL

- More than **1,000 sq.m.** of any new building or change of use.

Departures from the relevant UDP

- 150 units (houses or flats).
- More than **2,500 sq.m.** of retail (A1), financial and professional (A2), food and drink (A3), business (B1), general industrial (B2), storage and distribution (B8), hotels (C1), residential institutions (C2), non-residential institutions (D1), assembly and leisure (D2).

Parking

- More than 200 spaces (non-residential).

Article 10(3) direction

Any development subject to such a direction, or any development on a site subject to such a direction. *(This includes safeguarded wharves and developments in a safeguarded strategic view; in the near future this will also include the safeguarded alignments for the East Thames river crossings).*

2006 Review of the Mayor's Powers

After wide consultation the Government has decided to grant increased powers to the Mayor on a number of key areas, including planning. The legislation granting these powers is expected to receive Royal Assent in summer 2007 and will enable the Mayor to:

- Direct changes to boroughs' programmes for the local development plans they produce.
- Have a stronger say on whether draft local development plans are in general conformity to his London Plan.
- Use his discretion to determine planning applications of strategic importance.

Appendix 8: Contributors' credits

The document was produced with the assistance of the APPLE working group, a sub-group of the London Air Quality Steering Group. Much of the guidance on mitigating dust emissions was based on existing BRE guidance and other guidance developed and used by individual London boroughs.

The APPLE working group is comprised from the following London local authorities:

Bexley, Brent, Camden, Greenwich, Hillingdon, Hounslow, Islington, Kensington and Chelsea, Lewisham, Newham, Southwark, Tower Hamlets, Wandsworth and Waltham Forest.

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- 5 GLA 2005, *London's Economy Today*, Issue 32
- 6 Department of Environment 1996, 3rd QUARG report, *Airborne particulate matter in the UK*
- 7 GLA 2004, *The London Plan: Spatial Development Strategy for Greater London*
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- 9 BRE 2003, *Controlling particles, vapour and noise pollution from construction sites - set of five Pollution Control Guides*
- 10 *Revised London Councils' Air Quality and Planning Technical guidance (draft)*, 2005
- 11 Bell & McGillivray 2000, *Environmental Law: 5th Edition*
- 12 For further information on the Local Air Pollution Prevention and Control Regime and to get copies of the statutory guidance:
www.defra.gov.uk/environment/airquality/lapc
- 13 The term 'construction activities' used in this document includes all demolition, construction and associated activities on that site.
- 14 A report on the Demolition Protocol, ICE (Commissioned by London Remade and prepared by EnviroCentre Ltd)
- 15 www.environment-agency.gov.uk
- 16 www.leq-bvpi.com/default.asp?Section=detritus
- 17 The material collected during cleaning may be recycled. However approval for recycling certain material is needed from the Environment Agency.
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- 22 Directive 2004/42/CE; On the limitation of emissions of volatile organic compounds due to the use of organic solvents in certain paints and

varnishes and vehicle refinishing products and amending Directive 1999/13/EC

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- 29 HSE 2002, *EH40. Occupational Exposure Limits*
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- 31 Beaman & Kingsbury 1981, *Clean Air* 11(2), p77-81
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- 33 This list is a distillation of Parts I-IV of the Schedule to the Town & Country Planning (Mayor of London) Order 2000.
- 34 Land is to be treated as used for a particular use if it was last used for that use, or if it is allocated for that use in the UDP, including proposals for a UDP or proposals to alter or replace a UDP.

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Vietnamese

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Greek

Αν θέλετε να αποκτήσετε αντίγραφο του παρόντος εγγράφου στη δική σας γλώσσα, παρακαλείστε να επικοινωνήσετε τηλεφωνικά στον αριθμό αυτό ή ταχυδρομικά στην παρακάτω διεύθυνση.

Turkish

Bu belgenin kendi dilinizde hazırlanmış bir nüshasını edinmek için, lütfen aşağıdaki telefon numarasını arayınız veya adrese başvurunuz.

Punjabi

ਜੇ ਤੁਹਾਨੂੰ ਇਸ ਦਸਤਾਵੇਜ਼ ਦੀ ਕਾਪੀ ਤੁਹਾਡੀ ਆਪਣੀ ਭਾਸ਼ਾ ਵਿਚ ਚਾਹੀਦੀ ਹੈ, ਤਾਂ ਹੇਠ ਲਿਖੇ ਨੰਬਰ 'ਤੇ ਫ਼ੋਨ ਕਰੋ ਜਾਂ ਹੇਠ ਲਿਖੇ ਪਤੇ 'ਤੇ ਰਾਬਤਾ ਕਰੋ:

Hindi

यदि आप इस दस्तावेज की प्रति अपनी भाषा में चाहते हैं, तो कृपया निम्नलिखित नंबर पर फोन करें अथवा नीचे दिये गये पते पर संपर्क करें

Bengali

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Urdu

اگر آپ اس دستاویز کی نقل اپنی زبان میں چاہتے ہیں، تو براہ کرم نیچے دئے گئے نمبر پر فون کریں یا دیئے گئے پتے پر رابطہ کریں

Arabic

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