CHESTERFIELD
BOROUGH COUNCIL

East Midlands Air Quality Network

Air Quality and Emissions Mitigation

Guidance for Developers

May 2023

Summary

The environment can impact negatively on the health and wellbeing of the population and of all the environmental factors, air pollution has the greatest impact. Current evidence indicates that air pollution is associated with cardiovascular disease, lung cancer, respiratory disease, asthma and stroke. Air pollution disproportionately affects the young, older people, those with underlying cardiopulmonary conditions and the most deprived within our communities.

In England, the mortality burden of exposure to particulate air pollution arising from human activities is estimated as an annual effect equivalent to 25,000 deaths, with an associated loss of life of 265,000 years[1]. For the East Midlands it has been estimated as an annual effect equivalent to 2,314 deaths, with an associated loss of life of 24,016 life-years attributable to particulate air pollution.

This technical planning guidance for Chesterfield Borough Council has been prepared in conjunction with the East Midlands Air Quality Network (EMAQN) and has been developed to supplement the National Planning Policy Framework (NPPF)[2]. This guidance will be reviewed and updated in light of any specific future national and local policy changes.

The East Midlands Air Quality Network (EMAQN) is a group of environmental health, public health, planning and transport professionals who aim to improve air quality across the East Midlands by sharing knowledge and best practice. The group is co-chaired by Public Health England and Kettering Borough Council.

This document aims to improve air quality across the East Midlands and thus improve the environment and health of the population. This will be achieved where possible through either preventing new emission sources or encouraging emission reductions, physical activity and health lifestyle choices. It aims to provide a consistent approach to air quality in the planning regime across the East Midlands. In producing this document the Council aims to provide developers with clear information as to what is required and how planning applications are evaluated in terms of air quality, which should help to speed up the planning process.

The document deals primarily with the air quality impacts from traffic emissions (the main contributor to ambient air pollution), however, point source emissions e.g. generators, incinerators, power plants and other potentially significant industrial/commercial sources of air pollution including the increasing use of biomass boilers are important local planning issues. The assessment and control of dust impacts during demolition and construction is also considered, as dusts contribute to airborne particulate matter. Greenhouse gas emissions are not addressed explicitly, as they are covered by other initiatives, but synergies exist between measures to minimise climate change and local air quality impacts.

It is recognised that new development will in the main inherently increase road transport emissions, both during the construction and operational phases. However, it is also

[1] Gowers, A. M., Miller, B. G. & Stedman, J. R. 2014. PHE-CRCE-010 Estimating Local Mortality Burdens associated with Particulate Air Pollution. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/332854/PHE_CRCE_010.pdf [Accessed 26/07/16].

[2] Department for Communities and Local Government - National Planning Policy Framework - https://www.gov.uk/government/publications/national-planning-policy-framework--2

recognised that sustainable development can be a positive force for change. The approach in this document seeks to minimise or offset road transport emissions wherever practicable, by securing reasonable emission mitigation while also seeking to counter the cumulative impacts arising from all developments and maximise potential benefits to health and the environment.

A key theme of the National Planning Policy Framework (NPPF) is that developments should enable future occupiers to make green vehicle choices and it explicitly states that low emission vehicle infrastructure, including electric vehicle re-charging, should be provided. This document seeks to develop consistent EV re-charging standards for new developments across the East Midlands.

An air quality assessment is undertaken to inform the decision making with regard to the development. It does not, of itself, provide a reason for granting or refusing planning permission.

The air quality assessment process follows a staged process:

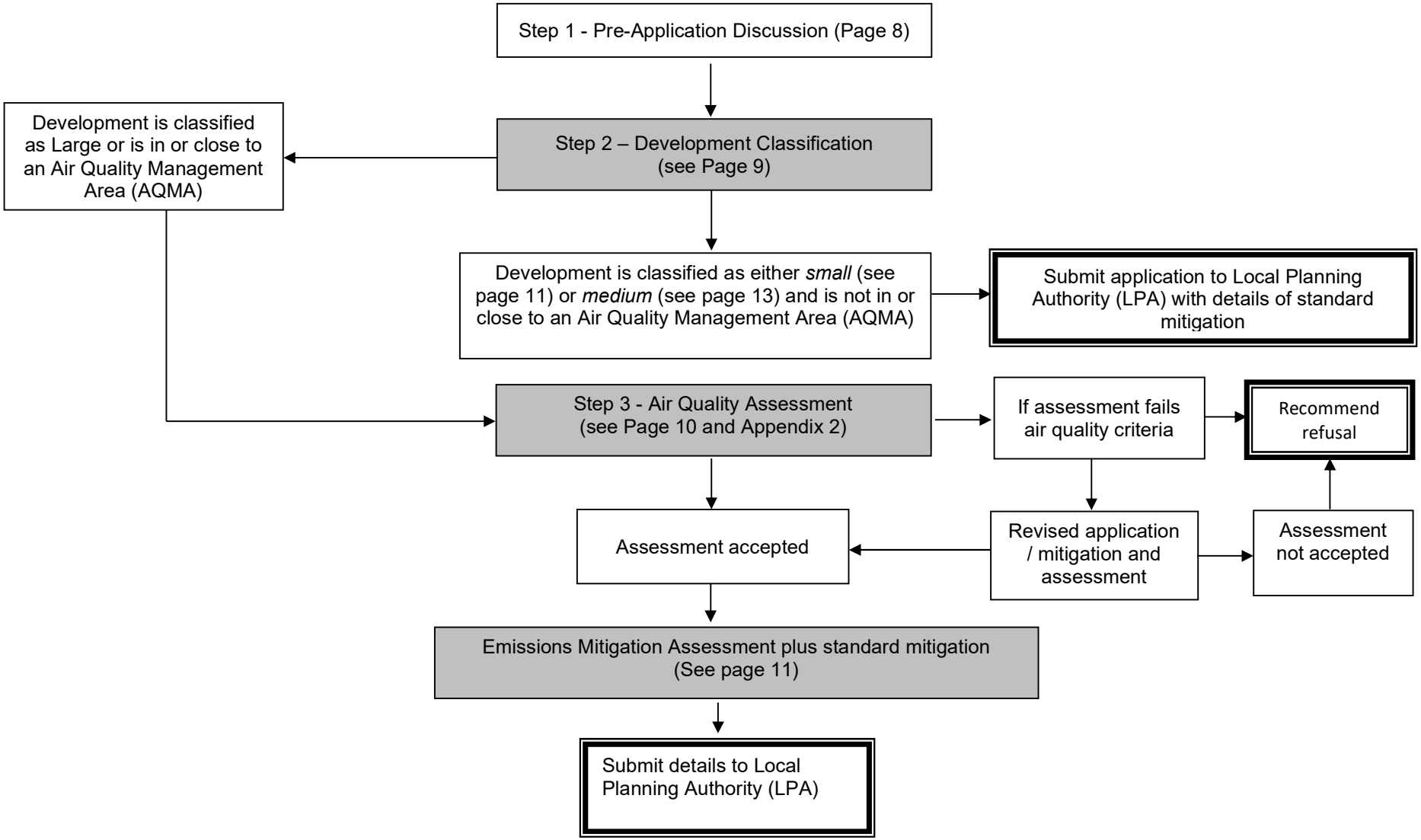
1. Using the '*Screening checklist*' to determine what impact the proposal is likely to have;

2. Determining whether the development requires an air quality assessment or emissions assessment using the '*Air quality and emission mitigation assessment checklist*';

3. Determining whether additional assessment is required to assess the impact on public health and/or the local environment as well as the significance of a development on local air quality; and

4. Determining whether an application should be refused on air quality grounds or what mitigation measures are required to make the development acceptable on air quality grounds.

Quick Reference Guide: Air Quality Assessment Process



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Acknowledgment
This document has been based on work carried out by Gedling Borough Council, the West Midlands Low Emissions Towns & Cities Programme, West Yorkshire Councils, and the Sussex Air Quality Partnership.

Our thanks are extended to them for their assistance in drafting this document.

Introduction

Purpose of this Guidance

It is recognised that new development will in the main inherently increase road transport emissions, both during the construction and operational phases. However, it is also recognised that sustainable development can be a positive force for change. The approach in this guidance seeks to maximise potential benefits to health and the environment, minimise road transport emissions wherever practicable to sustainable levels, and to counter the cumulative impacts arising from the emissions arising from new development schemes over time.

Although the focus of this guidance concerns air quality issues primarily arising from road transport emissions, it also considers the related benefits of tackling greenhouse gas and noise emissions from road transport as additional benefits. Separate guidance is available to assist developers when considering emissions from other sources, including point sources (eg, biomass installations).[3]

The NPPF introduces the presumption that planning approval will be granted for *sustainable development*. This guidance document seeks to define what is meant by 'sustainable' in air quality terms in order to provide consistency and clarity to local authority practitioners and developers alike.

A key consideration in the NPPF is the cumulative impact of development on pollution levels; therefore, this guidance seeks to simplify assessment and mitigation procedures through a standardised development scheme classification, according to potential scheme impact, while recommending the types of appropriate and reasonable mitigation measures that should be designed into each scheme classification.

The process outlined below provides an indicative step by step approach to dealing with planning applications that have the potential to create relevant exposure to road transport emissions (nitrogen dioxide (NO_2) and particulate matter ($PM_{10/2.5}$)) for future occupants of a development, or where the proposed development scheme has the potential to increase concentrations of pollutants in the surrounding area arising from road transport emissions (see flow chart – Figure 2 below).

A basic hierarchy of principles is used as the basis for mitigating the operational air quality impacts associated with development schemes.

[3] EPUK guidance available at http://www.iaqm.co.uk/text/guidance/epuk/biomass_developers_leaflet.pdf

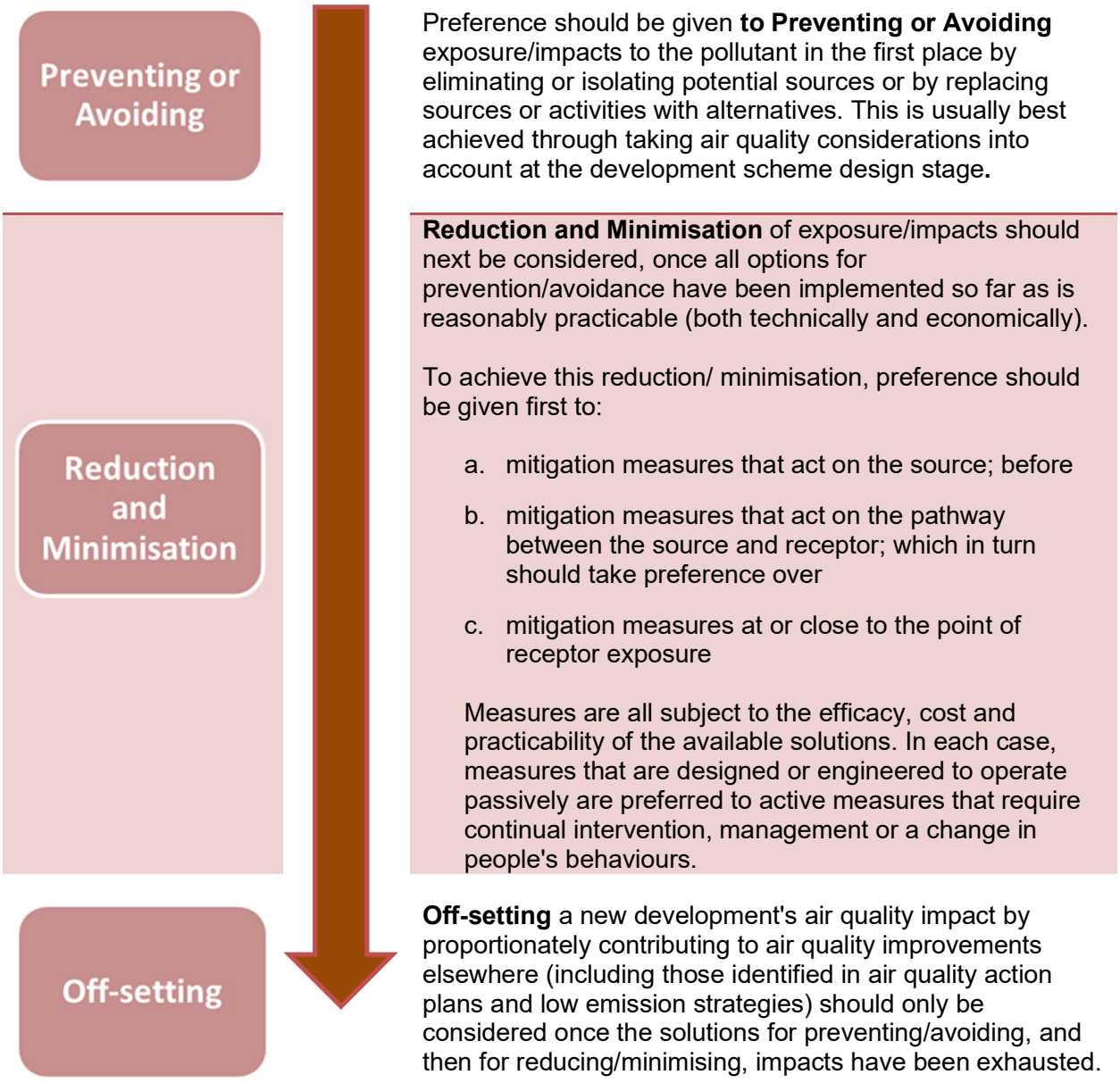

Figure 1: Hierarchy of air quality mitigation for development[4]

By incorporating mitigation measures into scheme designs as standard, this approach helps to counteract incremental increases in air pollution associated with cumulative development over time.

Air Pollution – What's the Problem?

Air pollution is the largest contributor to the burden of disease from the environment which impacts on the whole population. Current evidence indicates that air pollution is associated with cardiovascular disease, lung cancer, respiratory disease, asthma and stroke. Air pollution

[4] *Position Statement – Mitigation of Development Air Quality Impacts, January 2015*
http://iaqm.co.uk/text/position_statements/mitigation_of_development.pdf

disproportionately affects the young, older people, those with underlying cardiopulmonary conditions and the most deprived within our communities.

Figure 2: Sources of air pollution including oxides of nitrogen (NOx) and fine particular matter (PM2.5)[5]

Different sources of pollution, including transport and non-transport sources, emit different types and ratios of pollutants. Whilst the extent to which the population and environment are exposed to harmful levels of air pollution is a complex issue, dependent on how pollutants travel in the atmosphere, their mixing and how they react under different meteorological conditions, Figure 3 shows how it can be conceptualised by a simple **Source** (emission source), **Pathway** (air, inhalation) **Receptor** (people, environment) model. Road transport emissions are relatively more impactful than those from other sources, as most emissions tend to occur in areas where people live and work, such as cities and towns.

[5] Department for Environment, Food and Rural Affairs (Defra), Public Health England (PHE). Air Quality A Briefing for Directors of Public Health, March 2017 - http://www.local.gov.uk/sites/default/files/documents/6.3091_DEFRA_AirQualityGuide_9web_0.pdf

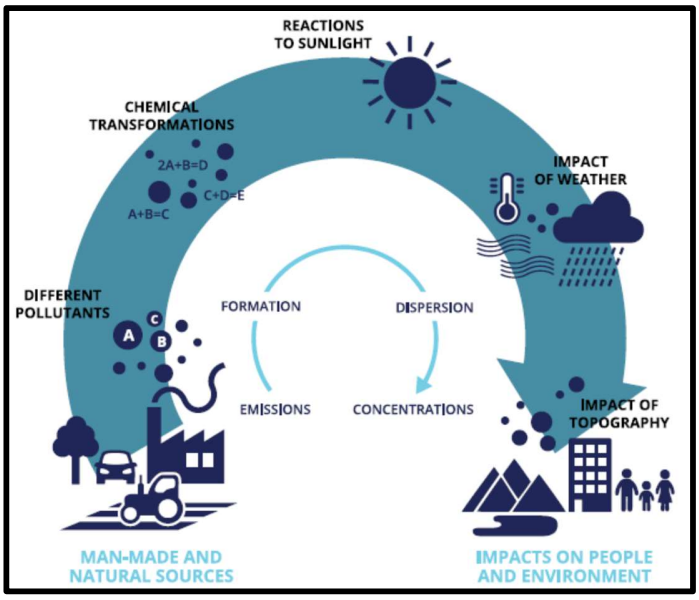

Figure 3: Air pollution: from emissions to exposure[6]

Health effects are mainly related to long-term exposure to particulate air pollution ($PM_{2.5}$) and nitrogen dioxide (NO_2) (Appendix 1). The primary sources of these pollutants are shown in Figure 2. In England, the mortality burden of exposure to particulate air pollution arising from human activities is estimated as an annual effect equivalent to 25,000 deaths, with an associated loss of life of 265,000 years (Appendix 1 - Air pollution and health). The Department for Environment, Food & Rural Affairs (Defra) has made an initial estimate that nitrogen dioxide (NO_2) contributes to shortening lives by an average of around 5 months – ranging from healthy individuals experiencing negligible effects to susceptible individuals whose poor health is seriously exacerbated by NO_2 pollution[5]. This overall population burden is estimated to be equivalent to nearly 23,500 deaths in the UK per year. There is likely to be an overlap levels in the health burden associated with ambient concentrations of particulate matter (PM) and NO_2 , so it is not possible to reliably estimate the combined health burden of multiple pollutants from the same sources, although it is reasonable to assume that some individuals will be adversely affected by exposure to both pollutants at the same time and that the total burden across the population will be increased to a certain extent. Further work is being undertaken to understand and quantify this overlap.

The financial implications arising from the health burden associated with air pollution are considerable. Defra have estimated the annual health costs for UK citizens to be in the region of £15 billion (range: £8-17 billion). As a comparison the health costs arising from obesity have been estimated to be around £10 billion per year.

Interventions that improve air quality and health deliver one or more of these high-level outcomes:

- Source reduction – reducing the sources of air pollution;
- Exposure reduction – reducing people's exposure to air pollution; and/or
- Improving physical and/or mental health.

[6] European Environment Agency -Air pollution: from emissions to exposure - https://www.eea.europa.eu/media/infographics/air-pollution-from-emissions-to-exposure/view

Local Context

Chesterfield Borough Council reviews and assesses the air quality across the Chesterfield to identify if there are any breaches of the National Air Quality Objectives. To date this has resulted in the declaration of 1 Air Quality Management Area. This has been declared based on high nitrogen dioxide (NO_2) levels.

Details on the Air Quality Management Area can be found on Chesterfield BC's website: https://www.chesterfield.gov.uk/health-and-environment/air-quality/air-quality-management-area-brimington.aspx

Public Health England has included an indicator in the Public Health Outcome Framework relating to air quality[7]. The indicator is a summary measure of the impact on death rates of long term exposure to man-made particulate air pollution. The indicator underlines the scale of the health impact and the fact that it is modifiable. Table 1 shows the estimated mortality burden in Derbyshire associated with particulate air pollution[1].

Table 1: Mortality burdens associated with particulate air pollution in Derbyshire

Area	Attributable deaths	Associated life years lost	Attributable Fraction
England	**25,002**	**264,749**	**5.6%**
East Midlands	**2,314**	**24,016**	**5.7%**
Derby UA	**131**	**1,425**	**6.1%**
Derby CC	**402**	**4,041**	**5.4**
Amber Valley	67	656	5.5%
Bolsover	46	440	5.6%
Chesterfield	59	572	5.4%
Derbyshire Dales	33	306	4.7%
Erewash	61	647	6.1%
High Peak	39	451	4.8%
North East Derbyshire	55	529	5.4%
South Derbyshire	42	439	5.4%

Air Pollution and Planning Policy – National Context

The impact on air quality is a material consideration in making planning decisions. Paragraph 124 of the National Planning Policy Framework (NPPF)[2] highlights that planning decisions should ensure that new development in AQMAs is consistent with the Council's local air quality action plan, and local policies should contribute to meeting EU limit values and national objectives for air quality.

The NPPF also states that:

[7] Department of Health. Public Health Outcomes Framework 2013 to 2016, last updated 2015. Available at http://www.phoutcomes.info/public-health-outcomes-framework#page/3/gid/1000043/pat/6/par/E12000004/ati/102/are/E06000015/iid/30101/age/230/sex/4

'Plans should protect and exploit opportunities for the use of sustainable transport modes for the movement of goods or people. Therefore, developments should be located and designed where practical to:

….

- *incorporate facilities for charging plug-in and other ultra-low emission vehicles; and…'*

(Paragraph 35)

'If setting local parking standards for residential and non-residential development, local planning authorities should take into account:

….

- *an overall need to reduce the use of high-emission vehicles.'*

(Paragraph 39)

The National Planning Practice Guidance includes a section on air quality which identifies that concerns could arise if a development is likely to impact areas where air quality is already known to be poor, particularly where it could lead to a breach of EU legislation (ie, exceed limit values for air pollutants). The NPPF is less clear whether impacts on air quality at levels below the National Air Quality Objectives can be a material planning consideration. However, the health evidence is unequivocal: any reduction in air pollution – even below limit values – will directly benefit public health, as pollutants such as nitrogen dioxide and particulate matter show no threshold below which health effects do not occur.

Currently, there is no statutory guidance on how to deal with air quality considerations through the planning system. Most guidance concerns itself with technical modelling of impacts, with little information provided on how best to mitigate impacts. Chesterfield Borough Council has taken the approach developed and adopted by councils in West Midlands, West Yorkshire and Sussex areas that simplifies the assessment of air quality impacts for development schemes and places more emphasis on incorporating standard road transport emission mitigation measures.

Each development dealt with through the planning system will have an impact on local air quality through road traffic it generates, for example, private traffic associated with residential schemes or deliveries to commercial schemes. By securing standard emission mitigation measures on each scheme, cumulative impacts arising from development over time can be minimised and health benefits can be maximised. This approach provides clarity and consistency for developers up front regarding what is required of new developments, which should help to speed up the planning process.

Air Pollution and Planning Policy – Local Context

This guidance is published as 'good practice guidance'. Key elements of the guidance will have been incorporated into the Council's emerging Local Plan (prepared within the framework set by the National Planning Policy Framework) and may be incorporated.

The Local Plan addresses both strategic and non-strategic site allocations and generic development management issues. The Local Plan will form part of the development plan for Chesterfield Borough Council and the policies within the document will be used to determine planning applications.

This document set outs simplified guidance for dealing with air quality and is aimed at all those involved in the submission and determination of planning applications where air quality needs to be addressed.

Aiming to provide transparency and consistency to developers, landowners, and the community regarding the basis for identifying and calculating the air quality impact and mitigation requirements for new developments, the guidance should be read in conjunction with other relevant policies and strategies.

In summary this guidance is designed to:

- Explain why air quality is important in the East Midlands and describe the existing policy framework;
- Incorporate air quality mitigation measures within new developments to offset incremental increases in pollutant emissions and ambient air pollution;
- Present the method for identifying development proposals where an air quality assessment will be required, and the processes involved; and
- Propose various options for site specific mitigation to protect future occupiers from poor air and how such measures will be secured and delivered.
- Confirm where a damage calculation may be appropriate and payment made to the Local Authority where mitigation is not appropriate.

Key policies related to the assessment of Air Quality in relation to applications for planning permission include:

CS8 Environmental Quality – which requires, where appropriate the submission of an assessment of impact on air quality. The following guidance seeks to clarify when such an assessment will be required and the form it should take.

CS20 Influencing the Demand for Travel – seeks to reduce congestion, improve environmental quality and encourage more active and healthy lifestyles, and seeks the provision of opportunities for electric vehicle charging.

Assessment and Mitigation – What is required?

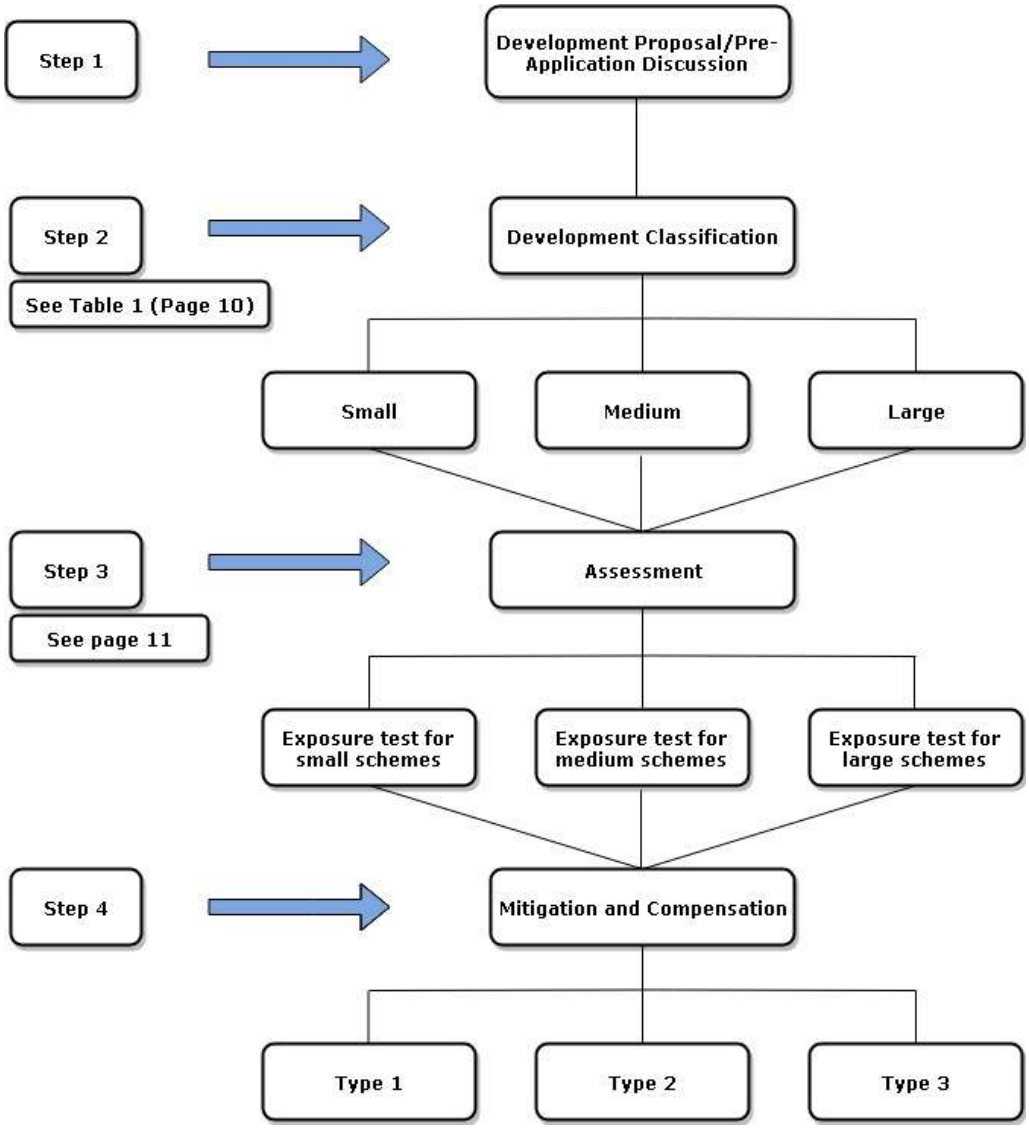

Figure 4: Assessment and Mitigation Flow Chart[8]

Step 1 – Pre-Application Discussion

It is important that planning authority requirements regarding scheme sustainability and the planning application validation process are identified at the earliest stage possible.

For this reason pre-application discussion involving planning management, air quality and public health professionals should take place at the outset to ensure optimum scheme design and avoid unnecessary delays in the planning process. This is particularly pertinent in relation to major schemes.

[8] *Good Practice Air Quality Planning Guidance*, West Midlands Low Emissions Towns & Cities Programme, May 2014)

Step 2 – Classification of the Development

Following discussions with Local Authority Planning and County Council Transport Officers, the likely air quality impact of developments have been categorised using the DfT Threshold Criteria for Transport Assessments[9] in addition to Defra Technical Guidance [TG (16)][10]; into Small, Medium and Large potential impacts (See Table 2: Potential Development below).

This is not limited to developments leading to a significant change in road traffic flows or other transport sources, but also includes any development that may affect air quality, with relevant exposure nearby, should be such as:

- Industrial installations;
- Biomass boilers;
- Combined Heat and Power (CHP) plant; and
- Landfill sites, quarries, etc.

Table 2: Potential Development Impacts

Scheme Type	Small	Medium	Large
Threshold	Below DfT threshold criteria for Transport Assessment[9]	Meets DfT threshold criteria for Transport Assessment. Where development meets DfT threshold criteria for a Transport Assessment based on considerations other than size or scale of land use. Or where the development is for any B2 or B8 use falling below the Large classification[11].	Medium type developments, which also trigger any of the following criteria: i.) Where development requires an EIA[12] ii.) Where development is likely to increase traffic flows by more than 5% on roads with >10,000 AADT[13] or change average vehicle speeds by > 10 kph/likely to cause increased congestion iii.) Where a proposal is likely to increase traffic by more than 5% on road canyons with >5,000 AADT. iv.) Where a development requires a Transport Assessment and HGV movements are =/> 10% of total trips. v.) Where significant demolition and construction works are proposed.
Assessment	None (other than for exposure)	None (other than for exposure)	Air Quality Assessment[14] required including an evaluation of changes in vehicle related emissions[15]

[9] The Department for Transport (DfT) Threshold criteria for Transport Assessments and Travel Plans (TA/TP) http://webarchive.nationalarchives.gov.uk/20100409053417/http://www.dft.gov.uk/adobepdf/165237/202657/guidanceontaappendixb

[10] Department for Environment, Food and Rural Affairs (Defra) - Local Air Quality Management Technical Guidance (TG16) (April 2016). Available at https://laqm.defra.gov.uk/documents/LAQM-TG16-April-16-v1.pdf

[11] B2 and B8 uses can generate significant HGV movements and would normally require mitigation to a Type 2 standard.

[12] Required where development is within or likely to create an area of exceedance of EU Limit Values and is within the scope.

[13] Annual Average Daily Traffic flow.

[14] See Appendix 2

[15] Assessment includes monetisation of the impacts arising from emission changes in line with Defra IGCB Damage Costs

Step 3 – Assessment

Where Exposure May Arise

Whilst a detailed Air Quality Assessment is not required for Small and Medium impact schemes, developers still need to consider whether the development will expose future occupiers to unacceptable levels of air pollution, defined as the exceedance of an air quality standard at the receptor location, and ensure that their development's potential benefits to air quality and health are maximised.

The determination of relevant exposure, where a short-term objective allows a number of exceedances of the standard because of considerations of feasibility and practicability, should be ascertained through reference to the Council's latest review and assessments of air quality; this can be checked on a case-by-case basis with the Public Protection Service at the Council during the pre-application stage.

For Large developments, the Air Quality Assessments will include the consideration of potential increased exposure for relevant receptors affected by the development. (See Appendix 2)

The Council, in considering policies on exposure, may give weight to the following mitigation measures:

- Can the curtilage of a residential building be set back beyond the pollutant exceedance zone?
- Can the scheme be designed to place residential units at the rear of the development or on higher floors?
- Can vegetative barriers, including appropriate tree species, offer some degree of separation from the road? (While several reports[16] [17] have highlighted some potential for certain vegetation species to reduce particulate concentrations, they also indicate a limited effectiveness in reducing exposure to nitrogen dioxide (NO_2) in the urban area)
- Can design of built forms avoid the creation of canyons, allowing a greater degree of pollutant dispersal?
- Mechanical ventilation should not automatically be seen as providing effective mitigation against exposure to air pollution and should be scrutinised carefully (eg, inlet location and level of pollutant attenuation, together with energy, maintenance and noise considerations)

Evaluation for all other circumstances

For all developments classified as Small and Medium, where "relevant exposure" is not a concern, an air quality assessment is not required and mitigation to make the development sustainable is specified for each classification of development and is termed Type 1 or Type 2

[16] Trees & Sustainable Urban Air Quality: Using Trees to Improve Air Quality in Cities http://www.es.lancs.ac.uk/people/cnh/docs/UrbanTrees.htm
[17] http://www.woodlandtrust.org.uk/en/planting-woodland/ why-plant-trees/environmental-benefits/Pages/default.aspx

(see Table 2)

An air quality assessment is required for all Large developments, a protocol for which is provided in Appendix 2. The protocol includes details of how to undertake an emissions assessment for a development and a calculation of damage costs. Damage costs are used to determine the level of Type 3 mitigation and/or compensation required to make the scheme acceptable – an explanation and an example of the calculation are provided in Appendix 3.

Table 2 below summarises the type of assessment, mitigation and/or compensation required for each of the development classifications.

Table 3: Summary of the Air Pollution Mitigation Requirements

Development Classification	Assessment Required	Mitigation	Compensation
Small	None (other than for exposure)	Type 1	-
Medium	None (other than for exposure)	Type 1 and 2	-
Large	Full AQ Assessment in line with Council Guidance, including evaluation of emission and concentration changes.	Type 1 and 2	Type 3

Step 4 – Mitigation and Compensation

This guidance assumes that Small and Medium schemes should not have a significant impact on air quality if the appropriate Type 1 and 2 mitigation, as outlined, is incorporated into development proposals. Where appropriate mitigation has been incorporated, such schemes can be considered as being sustainable in air quality terms.

In addition to Type 1 and Type 2 mitigation, Large schemes may require additional Type 3 mitigation which is determined in scale by the calculation of emission damage costs associated with the scheme.

The required mitigation is summarised below, and further detail is provided in the following section:

Table 4: Summary of the Potential Air Pollution Mitigation

Type 1	The adoption of an agreed protocol to control emissions from construction sites Provision of Electric Vehicle Recharging All gas-fired boilers to meet a minimum standard of 40mgNOx/kWh or consideration of alternative heat sources
Type 2	Practicable mitigation measures supported by the NPPF; Active travel (cycling/walking) infrastructure including, but not limited to: • Developing cycle routes or pedestrianised areas and infrastructure to support low emission modes of transport; • improved facilities to encourage cycling or other non-motorised travel (shower facilities, secure cycle storage etc); and • signage;
Type 3	Additional measures that may be required by either planning condition or Planning Obligation by a Section 106 Agreement to make the site acceptable, using reasonable endeavours. The Type 2 & 3 mitigation measures presented in this guidance are not exhaustive lists and should be seen as defaults. Innovative solutions to air quality mitigation are encouraged.

The type of mitigation agreed will be informed by:

- Outcomes from the Transport Statement/ Assessment;
- Specific needs identified in site specific spatial policy allocations;
- Travel Awareness/Planning and Highway Development requirements;
- Defra air quality guidance

Type 1 Mitigation

Construction Dust Emissions

See *Construction Phase - Emissions Mitigation and Assessment* section below.

Table 5: Type 1 Mitigation Measures – Adherence to Construction Good Practice

	Small	Medium	Large
Appropriate Code of Construction Practice	IAQM Guidance[18]	IAQM Guidance	IAQM Guidance
	Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London Non-Road Mobile Machinery NRMM standards, where applicable		

Electric Vehicle Charging Infrastructure

Electric or hybrid-electric powered vehicles currently form a small percentage of the total number of vehicles on the road. However, electric/hybrid vehicles will become more popular, further advances in technology are anticipated, and the likelihood is that these vehicles will become less expensive. Together with future development of Government policy in this

[18] Guidance on the assessment of dust from demolition and construction - Version 1.1. Institute of Air Quality Management (IAQM) available at http://iaqm.co.uk/text/guidance/construction-dust-2014.pdf

area[19], it is possible that a significant percentage of vehicles will be electric or part electric powered in the near future.

A key theme of the NPFF is that developments should enable future occupiers to make green vehicle choices and it explicitly states that low emission vehicle infrastructure, including electric vehicle (EV) re-charging, should be provided. This guidance seeks to develop consistent EV re-charging standards for new developments in the Borough.

Please refer to guidance produced by IET '*Code of Practice for EV Charging Equipment Installation'* for details of charging points and plugs specifications; for both exterior and garage situations.[20]

From 15th June 2022 Part S of the Building Regulations 2010 comes into force. More information is available at:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1057375/AD_S.pdf

Developers will need to ensure compliance with Part S.

Heating and Hot Water Generating Appliances

While the main sources of air pollutants are dominated by road transport and large combustion plants; homes and the choice of heating and hot water systems do have an impact. Levels of oxides of nitrogen (NO_x) vary considerably across the UK, with levels in urban areas and close to major roads many times greater than in rural areas. Emissions from heating systems have a greater impact in areas where there is a high population density, but improved air quality benefits health in both urban and rural settings.

Home Quality Mark (HQM)[21] is a voluntary and customer-focused assessment and certification scheme. It recognises new homes where performance meets best practice standards that are often significantly above that required by regulation. It defines a rigorous evidence-based, relevant and independent voluntary standard for new homes built on tried and tested processes commonly used in the UK and internationally. Chapter 17 of the HQM guidance discusses how to use heating and hot water generating appliances that have minimal impact on local air quality.

Type 2 Mitigation Measures

The NPPF recommends that where a development scheme requires a Travel Plan then all road transport mitigation measures are included within the Plan. For Medium and Large development categories, Type 2 mitigation should be incorporated into scheme design where appropriate (*Preventing or Avoiding*), in addition to Type 1.

Cycling Infrastructure

The promotion of cycling and other methods of active travel are one of the core principles of the NPPF[2] and it is increasingly being seen as a vital part of any local authority plans to tackle congestion, improve air quality, promote physical activity and improve accessibility.

[19] Office for Low Emission Vehicles https://www.gov.uk/government/organisations/office-for-low-emission-vehicles
[20] Code of Practice for Electric Vehicle Charging Equipment Installation 2nd Edition - http://www.theiet.org/resources/standards/ev-cop.cfm
[21] Home Quality Mark – Technical Manual. SD232: 1.0. 2015 http://www.homequalitymark.com/filelibrary/HQM-Beta--England--2015_SD232_r1.0.pdf

Provision for cycling is better when integrated with spatial planning of development, and with integrated planning for movement in all its forms. The guidance below covers general advice for street planning as well as some focused on cycling specifically.

'Manual for streets[22]' provides guidance that aims to reduce the impact of motor vehicles on residential streets through intelligent design which gives a high priority to the needs of pedestrians, cyclists and users of public transport. These philosophies are built on further in 'Manual for streets 2[23]' which demonstrates through guidance and case studies how they can be extended beyond residential streets to encompass both urban and rural situations.

'Handbook for cycle-friendly design[24]' from Sustrans provides technical design guidance starting from network planning, through infrastructure features and construction design, and including management and maintenance. Whilst 'Making Space for Cycling[25]' is a guide for new development and street renewal in existing urbanised areas, prepared by Cyclenation. It covers the design principles required, from main roads down to local streets, as well as complementary measures such as cycle parking.

Department for Transport have also composed guidance in the form of Local Transport Notes.[26,27]

A list of some typical Type 2 mitigation measures are provided in the table below:

[22] Department for Communities and Local Government - Manual for streets https://www.gov.uk/government/publications/manual-for-streets
[23] Department for Communities and Local Government - Manual for streets 2 https://www.gov.uk/government/publications/manual-for-streets-2
[24] Sustrans Design Manual Handbook for cycle-friendly design April 2014 http://www.sustrans.org.uk/sites/default/files/images/files/Route-Design-Resources/Sustrans_handbook_for_cycle-friendly_design_11_04_14.pdf
[25] Cambridge Cycling Campaign - Making Space for Cycling: A guide for new developments and street renewals http://www.makingspaceforcycling.org/MakingSpaceForCycling.pdf
[26] Department for Transport - Local transport notes https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/3808/ltn-2-08.pdf
[27] Department for Transport - Shared use routes for pedestrians and cyclists (LTN 1/12) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/9179/shared-use-routes-for-pedestrians-and-cyclists.pdf

Table 6: Examples of Type 2 Mitigation for Scheme Sustainability

Mitigation Options	Standard mitigation plus: **Residential** ▪ Travel plan (where required) including mechanisms for discouraging high emission vehicle use and encouraging the uptake of low emission fuels and technologies ▪ A Welcome Pack available to all new residents online and as a booklet, containing information and incentives to encourage the use of sustainable transport modes from new occupiers ▪ Eco-driver training and provision of eco-driver aid to all residents ▪ EV recharging infrastructure within the development (wall mounted or free standing in-garage or off-street points) ▪ Car club provision within development or support given to local car club/eV car clubs ▪ Designation of parking spaces for low emission vehicles ▪ Improved cycle paths to link cycle network ▪ Adequate provision of secure cycle storage ▪ Using green infrastructure, in particular trees to absorb dust and other pollutants **Commercial/Industrial** - As above plus: ▪ Differential parking charges depending on vehicle emissions ▪ Public transport subsidy for employees ▪ All commercial vehicles should comply with either current or previous European Emission Standard ▪ Fleet operations should provide a strategy for considering reduced emissions, low emission fuels and technologies ▪ Use of ultra-low emission service vehicles ▪ Support local walking and cycling initiatives ▪ On-street EV recharging ▪ Contributing funding to measures, including those identified in air quality action plans and low emission strategies, designed to offset the impact on air quality arising from new development **Additional mitigation** ▪ Contribution to low emission vehicle refuelling infrastructure ▪ Low emission bus service provision or waste collection services ▪ Bike/e-bike hire schemes ▪ Contribution to renewable fuel and energy generation projects ▪ Incentives for the take-up of low emission technologies and fuels *For guidance on selecting the best air quality species please refer to the Urban Air Quality 2012 Woodland Trust document[28]

Note: The above list is not exhaustive and further options may be suggested where appropriate and justified, depending on the scale of development and air quality issues within the local area.

Type 3 Mitigation Measures

This type of mitigation is only required in the case of Large development; in addition to Type 1 and 2 measures having been applied. In some cases the calculated value of the air quality impact may be used on projects to 'offset' the emissions from the proposal.

The process by which these measures are calculated and chosen can be found in Appendix 3.

[28] Urban Air Quality, The Woodland Trust, April 2012

Travel Plan Requirements

Travel Plans should be designed to:

With respect to travel planning it is essential that;

The content of the travel plan is fully assessed prior to its approval in co-ordination with Derbyshire County Council transport officers.

The measures and targets included in the travel plan are secured for implementation by mutual agreement of the Borough Council and the developer/applicant (normally by means of an s106 Legal Agreement). Procedure for failure to meet objectives must form part of the agreement.

The outputs of the travel plan (normally trip levels and mode split) are annually monitored against the agreed targets and objectives

The travel plan is reviewed annually to assess whether it is delivering its anticipated outputs or whether it has failed to meet its targets and if the latter what mitigation/ alternative measures need to be put in place to address the travel impact/ requirements of the scheme.

A named co-ordinator will be an essential element of any travel plan. For larger schemes a commitment in terms of staff resource allocation will be expected, this will be determined on a case by case basis in co-ordination with the Local Authorities.

Construction Phase - Emissions Mitigation and Assessment

Mitigation

All development should consider the effect construction operations will have on emissions and as such mitigation should be considered (See Table 4) in all cases. The IAQM Guidance on the assessment of dust from demolition and construction[18] or alternatively the London Best Practice Guidance[29] should be used to inform the choice of mitigation measures required during construction.

Assessment

In the case of a Large development, where an air quality assessment is required, that assessment should also include an assessment of the air quality effects of the construction phase.

Guidance published by the Institute of Air Quality Management[18] (IAQM) sets out the methodology for assessing the impacts on air quality from the construction phase of any development. (See Appendix 2)

Scheme Mitigation Statement

Each development requires a brief mitigation statement; outlining the measures proposed (Type 1-3) depending on development scale.

This would also include the mitigation measures suggested from the IAQM Guidance on the assessment of dust from demolition and construction[18] or London Best Practice Guidance[29], to minimise dust and other emissions to atmosphere during the construction phase.

In addition, in the case of Large developments, the statement should include an assessment of impacts and mitigation measures associated with the construction phase, as assessed as part of the wider development's detailed air quality assessment (see Appendix 2).

[29] The Control of Dust and Emissions from Construction and Demolition, Best Practice Guidance. Available at http://www.london.gov.uk/sites/default/files/BPGcontrolofdustandemissions.pdf

Appendix 1

Air Pollution and Health

Air pollution

Air pollution is the largest contributor to the burden of disease from the environment that can impact on the whole population. Current evidence indicates that air pollution is associated with cardiovascular disease, lung cancer, respiratory disease, asthma and stroke. Air pollution disproportionately affects the young, older people, those with underlying cardiopulmonary conditions and the most deprived within our communities.

Risks are mainly related to long-term exposure to particulate air pollution ($PM_{2.5}$) and nitrogen dioxide (NO_2). Nitrogen dioxide (NO_2) is produced with nitric oxide (NO) during the combustion of fossil fuels. Together they are often referred to as oxides of nitrogen (NO_x). The evidence associating NO_2 with health effects has strengthened substantially in recent years. There is increasing evidence that links long-term exposure to NO_2 to mortality, although it is possible that, to some extent, NO_2 acts as a marker of the effects of other traffic-related pollutants[30].

Particulate matter (PM) is an air pollutant which contains a mixture of microscopic solid and liquid particles suspended in air. It is made of various physical and chemical components such as nitrates, sulphates, ammonium and other inorganic ions; organic and elemental carbon; polycyclic aromatic hydrocarbons (PAHs); metals such as copper, zinc and nickel; dust, soil and smoke. Biological components such as allergens and microbial compounds are also found in PM[31]. The commonly used definition of PM refers to the mass concentration of particles with a specified diameter. PM with a diameter of 10µm or less referred to as PM_{10} and particles with a diameter 2.5µm or less are referred to as $PM_{2.5}$. PM also includes ultrafine particles which have a diameter of less than 0.1µm.

Similarly, there will be a health burden from short-term exposure to some air pollutants (e.g. ozone) although this impact is likely to be less[32]. Other pollutants of less concern, in terms of their typical concentration in the air that we breathe, include benzene (C_6H_6), sulphur dioxide (SO_2), carbon monoxide (CO), lead (Pb) and 1,3-butadiene.

The financial implications arising from the health burden associated with air pollution are considerable. Defra have estimated the annual health costs for UK citizens to be in the region of £15 billion (range: £8-17 billion). As a comparison the health costs arising from obesity have been estimated to be around £10 billion per year[33] . There is, however, relatively low public awareness of air quality as an issue, making air pollution an invisible public health problem that affects much of the UK.

Actions that improve local air quality can deliver public health benefits across entire local authority areas. There are no thresholds of effect identified for nitrogen dioxide and particulate matter and therefore health benefits can be expected from improving air quality even below

[30] Committee on the Medical Effects of Air Pollutants (COMEAP) - Statement on the evidence for the effects of nitrogen dioxide on health. Available at https://www.gov.uk/government/publications/nitrogen-dioxide-health-effects-of-exposure

[31] World Health Organisation (WHO) - Health Effects of Particulate Matter. Available at http://www.euro.who.int/__data/assets/pdf_file/0006/189051/Health-effects-of-particulate-matter-final-Eng.pdf

[32] Committee on the Medical Effects of Air Pollutants (COMEAP) - Long-term exposure to air pollution: effect on mortality (final report - June 2009). Available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/304667/COMEAP_long_term_exposure_to_air_pollution.pdf

[33] Department for Environment, Food and Rural Affairs - Air Pollution: Action in a Changing Climate (2010). Available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69340/pb13378-air-pollution.pdf [Accessed 26/07/16].

concentrations stipulated by air quality standards[34].This means that action to improve air quality is not just about dealing with areas where there are exceedances of air quality standards.

There is growing evidence that tackling air pollution can be a key element of growth and regeneration policies. Town centres can benefit in many different ways from measures that reduce air pollution potentially including reduction of noise pollution and surface temperature, increased amenity value, and improved aesthetic appearance. Further to this these measures improve health outcomes and reduce health inequalities in a cost-effective way that promotes healthy and active lifestyles, therefore leading to social and economic benefits. Spatial planning has an important role to play in improving air quality and reducing people's exposure to air pollution. New urban developments can be designed to improve local air quality and the health of the local population by considering the placement of transport and industrial infrastructure, better street design to encourage community cohesion and better use of innovative building design.

Air Pollution and Public Health

In England, the mortality burden of exposure to particulate air pollution arising from human activities is estimated as an annual effect equivalent to 25,000 deaths, with an associated loss of life of 265,000 years[1]. For the East Midlands it has been estimated as an annual effect equivalent to 2,314 deaths, with an associated loss of life of 24,016 life-years attributable to particulate air pollution.

Public Health England publishes an annual indicator in the Public Health Outcome Framework relating to air quality[7]. The indicator is a summary measure of the impact on death rates of long term exposure to man-made particulate air pollution. The indicator underlines the scale of the health impact and the fact that it is modifiable.

PHE have estimated the mortality burden are based on modelled annual average concentrations of fine particulate matter ($PM_{2.5}$) in each local authority area originating from human activities, based on the attributable mortality in 2010[1]. These estimates are useful when assessing local public health priorities, as well as to those working in the field of air quality and public health. The data for the East Midlands can be found on page 12 of the report.

There are a range of evidence-based and achievable actions which improve air quality and health outcomes[35]. Action can be taken at a number of levels and, in some cases, air quality initiatives significantly complement programmes to increase physical activity, decrease obesity and improve cardiovascular and respiratory health.

For example:

- Nearly 80 per cent of car trips under five miles could be replaced by walking, cycling or using public transport[36];
- Active travel can be promoted by local authorities and major local employers[35];

[34] World Health Organization (WHO) Regional Office for Europe. Review of evidence on health aspects of air pollution - REVIHAAP Project: Final technical report2013 15/10/14. Available from: http://www.euro.who.int/en/health-topics/environment-and-health/air-quality/publications/2013/review-of-evidence-on-health-aspects-of-air-pollution-revihaap-project-final-technical-report

[35] The Kings Fund - Improving the public's health: A resource for local authorities. Available at https://www.kingsfund.org.uk/sites/files/kf/field/field_publication_file/improving-the-publics-health-kingsfund-dec13.pdf

[36] Cabinet Office Strategy Unit, An Analysis of Urban Transport. 2009. Available at http://webarchive.nationalarchives.gov.uk/+/http:/www.cabinetoffice.gov.uk/media/308292/urbantransportanalysis.pdf [accessed 28/07/16]

- Street environments can prioritise place over cars and increase perceptions of safety, quality of life and 'walkability'[35];
- Susceptible individuals (the elderly, those with existing heart disease and respiratory disease) can be informed of the risks of air pollution, and helped to take avoiding action using air pollution forecasts[37];
- 'Eco-driving' training can be organised for taxi-drivers to encourage more fuel-efficient driving, and reduce idling at taxi ranks[38];
- Boilers can be replaced with the least polluting models[38];
- New buildings can be made "air quality neutral"[38]; and
- Local authority powers can be used to regulate types of traffic and traffic flows to ensure that they are fully contributing to public health strategies and goals[35].

Prioritising action in this way delivers benefits across the agendas of local authorities and clinical commissioners, and benefits the following public health outcomes (expressed as Public Health and NHS Outcome indicators).

Table 7: Public Health Outcome Framework indicators which can be positively affected by air quality interventions[7]

1.10 (PHOF)	Rate of people killed and seriously injured on the roads, all ages, per 100,000 resident population
1.16 (PHOF)	Percentage of people using outdoor space for exercise/health reasons
2.06i (PHOF)	Percentage of children aged 4-5 classified as overweight or obese
2.06ii(PHOF)	Percentage of children aged 10-11 classified as overweight or obese
2.12 (PHOF)	Percentage of adults classified as overweight or obese
2.13i (PHOF)	Percentage of adults achieving at least 150 minutes of physical activity per week in accordance with UK CMO recommended guidelines on physical activity
3.01 (PHOF)	Fraction of all-cause adult mortality attributable to longterm exposure to current levels of anthropogenic particulate air pollution
3.06 (PHOF)	Percentage of NHS organisations with a board approved sustainable development management plan
4.04i (PHOF)	Age-standardised rate of mortality from all cardiovascular diseases (including heart disease and stroke) in persons less than 75 years of age per 100,000 population
4.07i (PHOF)	Age-standardised rate of mortality from respiratory disease in persons less than 75 years per 100,000 population
2.3i and 2.3ii (NHS OF)	Reducing time spent in hospital by people with long-term conditions i Unplanned hospitalisation for chronic ambulatory care sensitive conditions (adults) ii Unplanned hospitalisation for asthma, diabetes and epilepsy in under 19s

[37] Brook, R.D. et al. Particulate Matter Air Pollution and Cardiovascular Disease : An Update to the Scientific Statement From the American Heart Association, Journal of the American Heart Association, Circulation 2010, 121:2331-2378.

[38] Kilbane-Dawe, I. 14 Cost Effective Actions to Cut Central London Air Pollution, Par Hill Research Ltd. Science, Environment and Policy Research. Available at http://www.rbkc.gov.uk/pdf/air_quality_cost_effective_actions_full_report.pdf, accessed 02.05.2014

Air Pollution and Climate Change

The burning of fossil fuels (such as petrol and diesel) is a primary source of both oxides of nitrogen (NO_x) and carbon dioxide (CO_2). Action on air pollution can co-benefit climate change mitigation and vice versa.

Appendix 2

Air Quality Assessments

Introduction

The purpose of an air quality assessment is to determine the predicted impact of a development on local air quality, public health and/or the local environment, to help determine the appropriate level of mitigation from a development. The assessment should be carried out by a developer's air quality consultant.

Air Quality Assessment Process

The Borough Council has used similar assessment methods to fulfil the requirements of its detailed Review and Assessment that led to the Air Quality Management Area (AQMA) designation. For consistency, air quality assessments for developments should, where possible, follow similar methodologies.

Local authorities will work with developers by providing guidance on the suitability of such measures, which should be incorporated at the early design stage of any proposal.

Guidance on the methodologies to be used for air quality assessments is also available in the Defra's Technical Guidance Note[10], and other guidance available from the Defra and IAQM webpages[39].

Key Components of an Air Quality Assessment

The assessment will require dispersion modelling utilising agreed monitoring data, traffic data and meteorological data. The modelling should be undertaken using recognised, verified local scale models by technically competent personnel and in accordance with LAQM TG16[10]. The study will comprise:

1. The assessment of the existing air quality in the study area for the baseline year with agreed receptor points and validation of any dispersion model;

2. The prediction of future air quality without the development in place (future baseline or do-nothing);

3. The prediction of future road transport emissions and air quality with the development in place (with development or do-something).

4. The prediction of future road transport emissions and air quality with the development (with development or do-something) and with identified mitigation measures in place.

5. Sensitivity test allowing for no improvement in traffic and background emissions.

The assessment report should include the following details:

A. Detailed description of the proposed development, including:
- Identify any on-site sources of pollutants;
- Overview of the expected traffic changes;
- The sensitivity of the area in terms of objective concentrations;

[39] Environmental Protection UK and the Institute of Air Quality Management - Land-Use Planning & Development Control: Planning For Air Quality (January 2017). Available at http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

- Local receptors likely to be exposed; and
- Pollutants to be considered and those scoped out of the process.

B. The relevant planning and other policy context for the assessment.

C. Description of the relevant air quality standards and objectives.

D. The basis for determining significance of effects arising from the impacts.

E. The assessment method details including model, input data and assumptions:

For traffic assessment;

- Traffic data used for the assessment;
- Emission data source;
- Meteorological data source and representation of area;
- Baseline pollutant concentration including any monitoring undertaken;
- Background pollutant concentration;
- Choice of base year;
- Basis for NOx:NO_2 calculations;
- A modelling sensitivity test for future emissions with and without reductions;

For point source assessments:

- Type of plant;
- Source of emission data and emission assumptions;
- Stack parameters – height, diameter, emission velocity and exit temperature;
- Meteorological data source and representation of area;
- Baseline pollutant concentrations;
- Background pollutant concentrations;
- Choice of baseline year;
- Basis for deriving NO_2 from NOx.

F. Model verification for all traffic modelling following Defra guidance[10]:

G. Identification of sensitive locations:

H. Description of baseline conditions:

I. Assessment of impacts:

- Comparisons between results of modelling the 'with development' scenario and 'no development' conditions;
- Descriptions of the impacts at the individual receptors should be provided;
- Comment on the sensitivity of the results to input choices

J. Description of demolition/construction phase impacts:

K. Cumulative impacts and effects:

L. Mitigation measures:

M. Summary of the assessment results:

- Impacts during the construction phase of the development (usually on dust soiling and PM10 concentrations);
- Impacts on existing receptors during operation (usually on concentrations of nitrogen dioxide, PM10 and PM2.5);

- Impacts of existing sources on new receptors, particularly where new receptors are being introduced into an area of high pollution;
- Any exceedances of the air quality objectives arising as a result of the development, or any worsening of a current breach (including the geographical extent);
- Whether the development will compromise or render inoperative the measures within an Air Quality Action Plan, where the development affects an AQMA;
- The significance of the effect of any impacts identified; and
- Any apparent conflicts with planning policy.

Air Quality Monitoring

In some case it will be appropriate to carry out a short period of air quality monitoring as part of the assessment work. This will help where new exposure is proposed in a location with complex road layout and/or topography, which will be difficult to model or where no data is available to verify the model. Monitoring should be undertaken for a minimum of six months using agreed techniques and locations with any adjustments made following Defra technical guidance[10].

Assessment of the Air Quality Impacts of Construction

Guidance published by the IAQM[18] sets out the methodology for assessing the impacts of air quality from the construction phase of any development.

The guidance, produced in consultation with the construction industry, considers the potential for dust emissions from the following activities:

- Demolition
- Earthworks (soil stripping, ground levelling, excavation)
- Construction, and
- Track out (the transportation of soil from the site onto public roads)

For each of these activities, the guidance considers three separate dust effects:

- Annoyance due to dust soiling;
- Harm to ecological receptors; and
- The risk of human effects due to a significant increase in exposure to PM_{10}

The methodology takes into account the scale (classed as small, medium, large) to which the above effects are likely to be generated and the distance of the closest receptors in determining the significance of effects arising from construction.

Appendix 3

Valuing Impacts on Air Quality for Type 3 Mitigation Measures

Emissions Assessment and Mitigation Calculation

For development schemes that have the potential for a Large detrimental impact on air quality, this guidance specifies an assessment procedure to evaluate the likely change in relevant concentrations and emissions arising from the scheme using the guidance produced by HM Treasury and Defra.

Two approaches are used to value changes in air quality, dependent on the nature of the change. They are:

- the ***impact pathway approach***, which is used in the majority of instances to value the consequences of changes in air quality such as on health, crops and buildings; and
- the ***abatement cost approach***, which is used in the limited instances where the change in air quality is likely to affect compliance with a legally binding obligation (whether causing, removing or changing the extent of non-compliance).

Chart 1.A (over) illustrates how to identify the appropriate approach.

The *abatement cost approach*[40] is relevant for the minority of situations where the breach of legally binding obligations is an issue. In such instances, it is still only those changes in air quality in excess of the relevant obligation that should be valued using this approach. Changes below the obligation should be valued using the *impact pathway approach*.

The *impact pathway approach* (I-PA) is the central methodology for appraisal. It values the air quality impacts of proposed decisions by estimating how changes in the ambient concentrations of air pollutants affect a range of health and environmental outcomes.

Full I-PA modelling is therefore quite resource and time intensive, requiring the estimation of emissions, dispersion, population exposure and outcomes. ***Damage costs*** have been developed to enable proportionate analysis when assessing the scale of air quality impacts where they are less significant. They are derived from the I-PA methodology to offer approximations of the value using representative modelling. The full I-PA uses bespoke analysis to provide a fuller assessment, suitable for cases where air quality impacts are significant. (See Appendix 2 Air Quality Assessment).

When total air quality impacts are estimated to be <u>less than</u> £50 million (in present value terms) it is recommended that *Damage Costs* are used. Where total air quality impacts are estimated to be in excess of £50 million a full *impact pathway assessment* should be considered in consultation with Defra.

It is considered that the damage cost approach will be sufficient in the majority of cases; thus the remaining of this Appendix will concentrate on this method of impact assessment.

[40] http://www.gov.uk/air-quality-economic-analysis

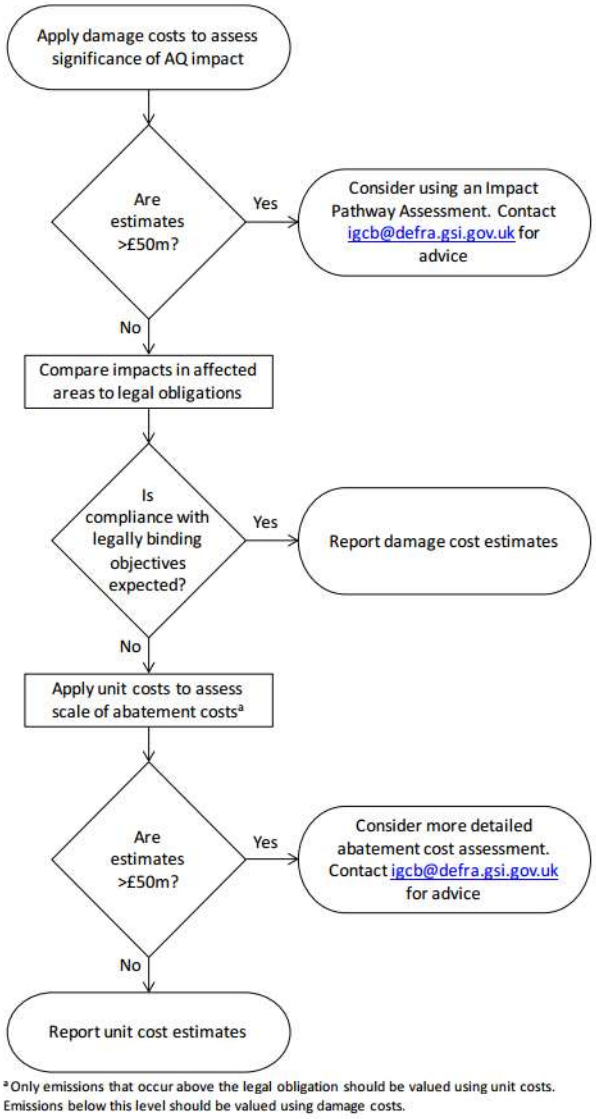

Figure 5: Overview of air quality valuation methodologies[41]

Damage Costs Calculation

As part of the assessment procedure a simple calculation is proposed to allow the quantification of any emission changes – the pollution impact of a scheme can then be monetised using the pollutant damage costs (per tonne) specified by the Defra Inter-Governmental Department on Costs and Benefits (IGCB)[42].

Taking into account Type 1 and 2 Mitigation Measures built into the scheme

The emissions calculator or toolkit (below) provides a basic emission calculation; however the proposal should already include some mitigation measures e.g. alternative fuels or technology

[41] HM Treasury and Department for Environment, Food and Rural Affairs (Defra)-.*Valuing impacts on air quality: Supplementary Green Book guidance* (May 2013) Available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/197893/pu1500-air-quality-greenbook-supp2013.pdf

[42] Department for Environment, Food and Rural Affairs (Defra)- Air quality: economic analysis. Available at https://www.gov.uk/air-quality-economic-analysis

(LPG, EV etc.), and these need to be taken into account during the damage costs calculation. The "advanced options" within the toolkit can accommodate inputs for alternative fuels.

Calculating Emissions

The emissions calculator provides a calculation to determine the amount of pollutant emissions a development is likely to produce. This in turn, by multiplying the damage cost for the key pollutants (PM_{10} and NOx see below), determines the amount (value) of mitigation that is expected to be spent on measures to mitigation those impacts.

The calculation uses the most current Defra Emissions Factor Toolkit[43] (EFT) to estimate the additional pollutant emissions from a proposed development. This will provide the relevant pollutant emissions outputs for the mitigation calculation, which is then multiplied to provide an exposure cost value. This value is used for costing the required emissions mitigation for the development (Example shown in Figure 6 below).

The emissions assessment and corresponding mitigation calculation follows this process:

1. An emissions assessment calculates additional trips[44, 45] generated by the development.
2. The emissions are calculated for pollutants of concern (NOx & PM_{10})
3. Using Defra IGCB Air Quality Damage Costs[19] for the specific pollutant emissions, the calculation then provides a resultant damage cost calculation.
4. The emissions total is then multiplied x 5, to provide a 5 year exposure cost value i.e.
5. The resulting 5-year exposure cost value, is the value that is to be used to implement mitigation measures within the development.

Example EFT Output = 32.55 kg/annum (NOx) & 3.795 kg/annum (PM)

= 0.0325 tonnes/annum (NOx) & and 0.003795 tonnes/annum (PM10)

X £25,252/tonne (NOx) + £58,125/tonne (PM10)

= £820.69 + £220.58

X 5 (years)

= £4,103.45 + £1,102.90

Total = £5,206.35

Figure 6: Example calculation based on a development with 10 domestic properties

[43] Defra Emissions Factor Toolkit: http://laqm.defra.gov.uk/review-and-assessment/tools/emissions.html
[44] Trip rates can be sourced from transport assessment or local authority/transport authority.
[45] Trip length uses the National Travel Survey:2011 - UK average = 7.1miles/10km https://www.gov.uk/government/collections/national-travel-survey-statistics

Type 3 Mitigation/Compensation Measures

By establishing the damage costs arising from development scheme emission changes it is possible to assess any additional mitigation or compensation that is required to make the scheme acceptable. A suite of mitigation/compensation measures termed Type 3 mitigation is shown in the table below:

Table 6: Examples of Type 3 Additional Mitigation and/or Compensation Required for Scheme Acceptability

Mitigation/ Compensation Options	• On-street EV recharging. • Contribution to low emission vehicle refuelling infrastructure. • Car clubs. • Low emission bus service provision. • Low emission waste collection services. • Bike/e-bike hire schemes. • Bike infrastructure. • Contribution to renewable fuel and energy generation projects. • Incentives for the take-up of low emission vehicle technologies and fuels. • Air Quality Monitoring programmes. • Other sustainable transport provision as appropriate to the development. • Contribution towards other public transport improvements.

Note: Where Type 3 mitigation is required, the planning authority and developer will agree measures that are appropriate and in scale and kind to the development. Such measures may be taken forward by condition, where possible, or through the use of a Section 106 Agreement.

The planning authority will need to take into account of any Type 3 mitigation measures that are included on a Community Infrastructure Levy (CIL) list.

The list in Table 8 is not exhaustive and further options may be suggested where authorities feel it is appropriate, depending on the scale of development and air quality issues within an area.

The mitigation options selected for a development should be relevant and appropriate to:

- Any local policies including Air Quality Action Plans, which may determine the mitigation priorities for a scheme that the local authority may wish to see be incorporated within a particular scheme.

- Any local air quality concerns; to assist in the remediation of potential cumulative air pollution impacts of the development on the local community.

- The type, size and activity of the development.