

# **The Mayor's School Air Quality Audit Programme**

Programme Report



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## Mayor's Foreword

Poor air quality is a major public health issue and cause of inequality in our city. It is shocking that in London alone, air pollution contributes to thousands of early deaths every year, and has been linked to strokes, heart attacks, asthma, dementia and smaller lungs in our children.

We cannot allow this to continue. That is why, since becoming Mayor, I have made tackling poor air quality a priority. That is also why my administration has nearly doubled spending on cleaning up London's toxic air and we are delivering the boldest and most ambitious plan to tackle air quality anywhere in the world.

This includes introducing a new charge on the oldest, most polluting vehicles coming into central London, consulting on expanding the Ultra Low Emission Zone, making buses in London cleaner and greener, and reducing exposure to air pollution around schools.

As part of this, we launched the Mayor's School Air Quality Audit Programme in January 2017, with the aim of reducing emissions and primary school children's exposure to polluted air. I am delighted that this programme has now been completed, with 50 audits undertaken at primary schools located in the most polluted areas of London.

We are confident that implementing the recommendations from these audits will go a long way to delivering cleaner air, reducing health inequalities and, most importantly, improving the health and wellbeing of our children.

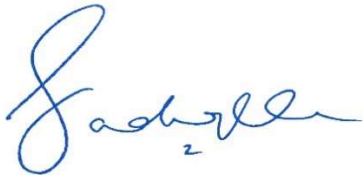
But we want to go even further. The implementation of the recommendations and dissemination of this programme offers us an invaluable opportunity to really make a difference. So, I want to see the London boroughs rolling it out to every school located in pollution hot spots.

The audit recommendations for the 50 schools that have already gone through the process are bespoke to each school, and whilst some recommendations will require funding to implement, there will be some that will not; such as changing walking routes to less exposed routes. Each report also contains a tool kit and template that could be used locally by other schools and similar organisations to undertake their own air quality audit.

We understand that schools and boroughs are under enormous financial pressure, which is why I am encouraging boroughs to prioritise funding through their Local Implementation Plan budgets provided by Transport for London (TfL). I am also urging Clinical Commissioning Groups and local businesses to consider setting aside some funding to support the funding of these recommendations.

In addition, we are keen to encourage schools to sign up to TfL's STARS (Sustainable Travel: Active, Responsible, Safe) programme, if they have not already done so. By swapping car journeys for active travel, through STARS, schools can make a real difference to our city and help create healthier streets for Londoners.

Finally, I would like to commend all those involved in the successful delivery of the School Air Quality Audit Programme - the schools, boroughs, consultants and, above all, the school children.

A handwritten signature in blue ink, appearing to read 'Sadiq Khan', with a small number '2' written below the name.

**Sadiq Khan**  
Mayor of London

## THE MAYOR'S SCHOOL AIR QUALITY AUDIT PROGRAMME



### ACKNOWLEDGEMENTS & CONTRIBUTIONS

London Borough of Barking and Dagenham  
St Peter's Catholic Primary School

London Borough of Barnet  
Tudor Primary School  
Wessex Gardens Primary School

London Borough of Brent  
Ark Franklin Primary Academy  
John Keble CofE Primary School

London Borough of Camden  
Christopher Hatton Primary School  
Gospel Oak Primary School  
Netley Primary School

London Borough of Ealing  
Ark Byron Primary Academy  
Christ the Saviour Church of England Primary School

London Borough of Enfield  
Bowes Primary School



## THE MAYOR'S SCHOOL AIR QUALITY AUDIT PROGRAMME

London Borough of Greenwich  
Haimo Primary School  
Invicta Primary School

London Borough of Hackney  
De Beauvoir Primary School  
William Patten Primary School

London Borough of Hammersmith and Fulham  
Melcombe Primary School  
St Paul's CofE Primary School

London Borough of Haringey  
Holy Trinity CofE Primary School  
Lordship Lane Primary School  
Welbourne Primary School

London Borough of Hounslow  
Cavendish Primary School  
St. Mary's Catholic Primary School  
The William Hogarth Primary School

London Borough of Islington  
Prior Weston Primary School and Children's Centre

London Borough of Kensington and Chelsea  
Holy Trinity CofE Primary School  
Oxford Gardens Primary School  
St Mary Abbots CofE Primary School

London Borough of Lambeth  
St Anne's Catholic Primary School  
Stockwell Primary School

London Borough of Lewisham  
Deptford Park Primary School  
Haseltine Primary School  
St James's Hatcham Church of England Primary School

London Borough of Merton  
Merton Abbey Primary School

London Borough of Newham  
Keir Hardie Primary School  
Salisbury Primary School

## THE MAYOR'S SCHOOL AIR QUALITY AUDIT PROGRAMME

London Borough of Redbridge  
Oakdale Junior School  
William Torbitt Primary School

London Borough of Richmond upon Thames  
East Sheen Primary School  
St Stephen's Church of England Primary School Richmond

London Borough of Southwark  
Charlotte Sharman Primary School  
Oliver Goldsmith Primary School

London Borough of Tower Hamlets  
Bonner Primary School  
Marners Primary

London Borough of Wandsworth  
Chesterton Primary School  
St Anne's CofE Primary School  
St Mary's RC Voluntary Aided Primary School

Westminster City Council  
Hallfield Primary School  
Clement Danes CofE Primary School  
St Mary's Bryanston Square CofE School  
St Peter's Eaton Square CofE Primary School

### **MEMBERS OF THE PROGRAMME STEERING GROUP**

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## DISCLAIMER

The contents of this report and its recommendations are principally based on the findings of the independent audit as of the date it was undertaken, and may not account for subsequent changes in local policy, conditions and/or circumstances in and/or around the school.

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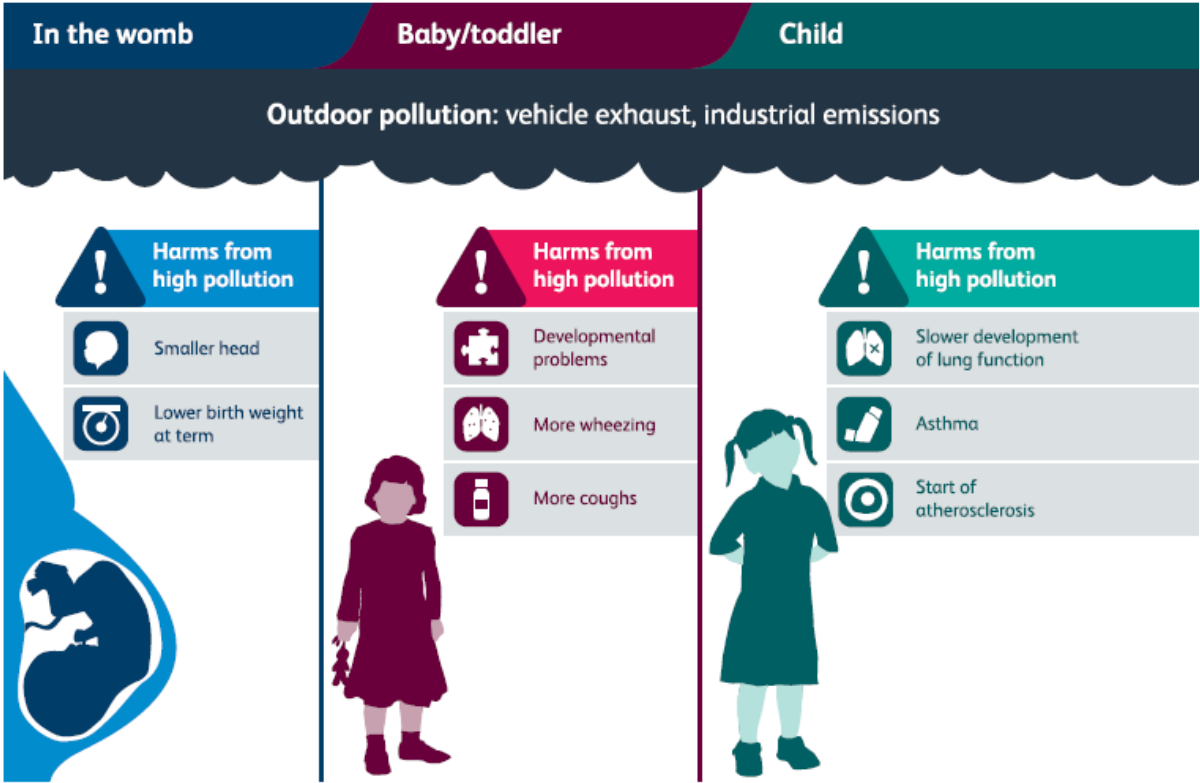
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# Chapter 1 – Introduction

**1 INTRODUCTION**

**1.1 BACKGROUND**

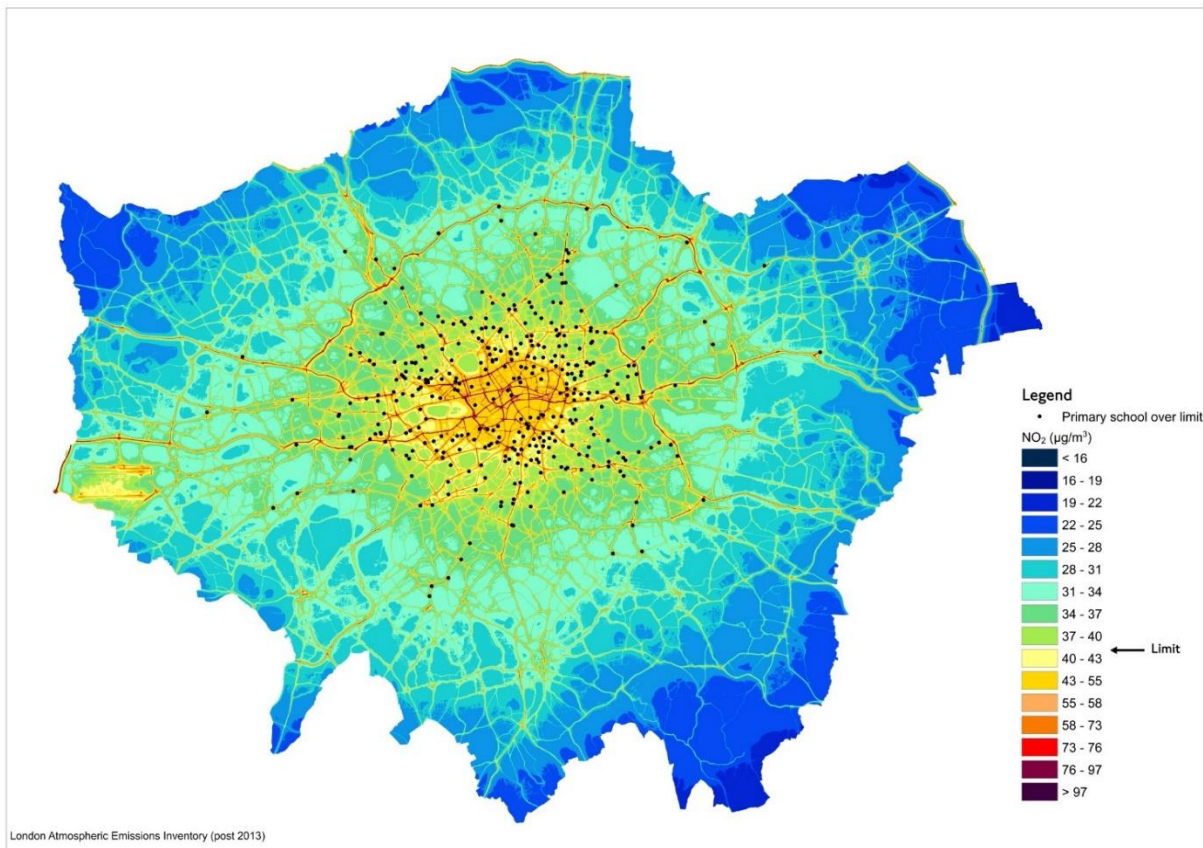
- 1.1.1. The Mayor has stated that London is experiencing a ‘*public health crisis*, and that he is committed to improving air quality, particularly for the most vulnerable Londoners.
- 1.1.2. Air pollution is ubiquitous; we often cannot help being exposed to it to some degree. It is not visible to the naked eye, but can harm us in years to come in ways we do not yet fully understand.
- 1.1.3. Over 400 primary schools are located in areas which exceed legal pollution limits, and 25% of primary schools are in areas with dangerously high levels of air pollution.
- 1.1.4. Primary school children are amongst the most vulnerable of the at risk groups, as their lungs are still developing, and toxic air can stunt their growth, causing significant health problems in later life. Long-term exposure to air pollution stunts children’s lung development, and in polluted areas of London children’s lungs have up to 10% lower capacity than usual.



- 1.1.5. Road transport is a major contributor to emissions, and has a significant impact on air quality, accounting for around half of NO<sub>x</sub> emissions. Whilst private car use is decreasing, congestion is

increasing<sup>1</sup>, and without significant intervention, as the capital grows rapidly these trends are set to continue.

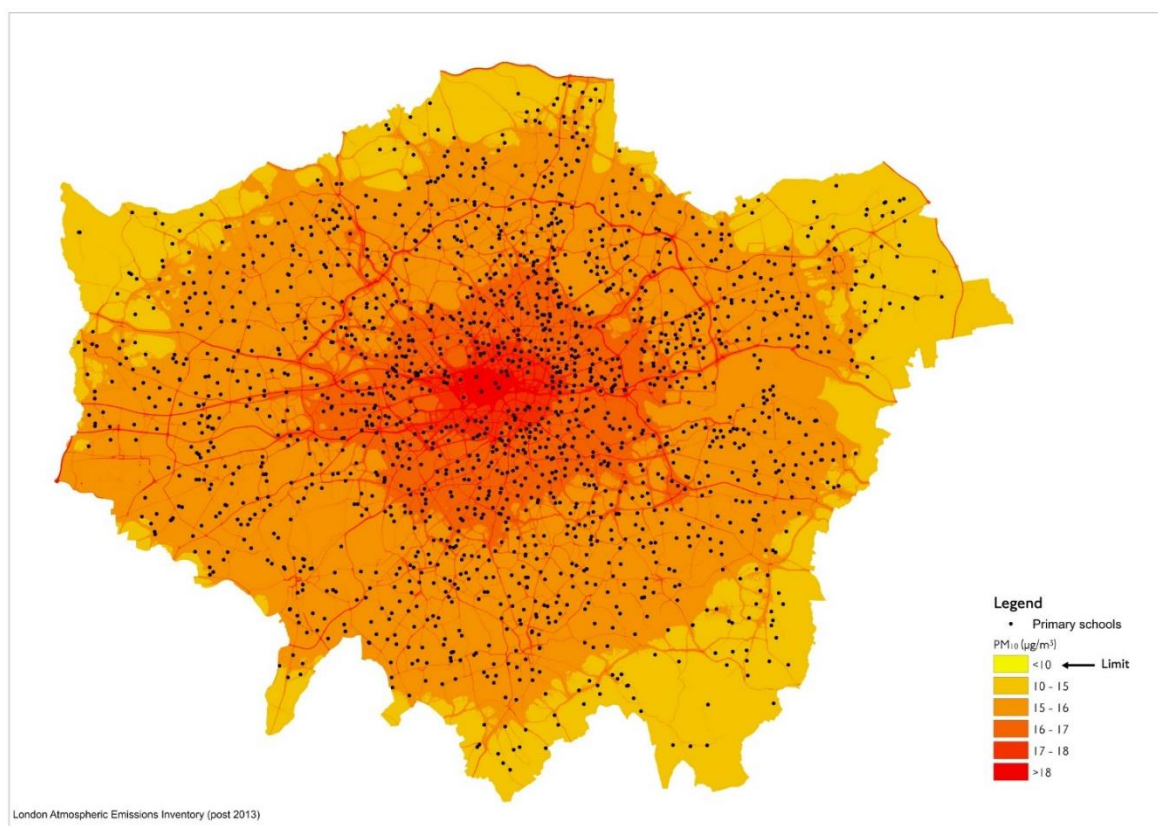
**Figure 1 – London’s more polluted primary schools and 2013 LAEI baseline annual mean NO<sub>2</sub> concentrations**



- 1.1.6. The above map of the capital’s more polluted schools and the corresponding levels of air pollution (measured in terms of Nitrogen Dioxide concentrations) highlights that they are concentrated in central and inner London, on major arterial roads, and along the North-South Circular.
- 1.1.7. The map is coloured so that everything shaded yellow, red and black exceeds the legal limit for nitrogen dioxide, which 40mg/m<sup>3</sup>. This limit value is set by the EU and will remain in force after Britain leaves the EU, unless specifically repealed.
- 1.1.8. In addition to these areas of high Nitrogen Dioxide concentrations, all of London’s primary schools are also exposed to PM<sub>10</sub> and PM<sub>2.5</sub> levels above the World Health Organisations (WHO)’s recommended safe levels of exposure.

<sup>1</sup> London Assembly, London stalling: Reducing traffic congestion in London, January 2017, Transport for London, Travel in London - Report 9 data, 2017

**Figure 2 - London's primary schools and 2013 LAEI baseline annual mean PM<sub>10</sub> concentrations**



1.1.9. In London poor air quality is also known to disproportionately affect lower socio-economic groups, with a clear link between exposure and deprivation<sup>2</sup>. Previous research has found that approximately 80% of primary schools above the legal limit are deprived schools<sup>3</sup>.

## 1.2 CLEANING LONDON'S AIR

1.2.1. In response the Mayor is implementing a significant programme of measures, including bold proposals to reduce London's deadly air pollution and protect the health and wellbeing of all Londoners, including:

- **The Toxicity Charge (T-Charge)** now applies to older, more polluting vehicles in central London, which means that including the Congestion Charge drivers with these vehicles will now pay £21.50 total during peak congestion.
- **Cleaning up London's Buses** - The Mayor is spending more than £300 million to transform London's bus fleet by retrofitting thousands of buses and committing to phase out pure diesel double deck buses from 2018. 12 Low Emission Bus Zones have been announced, two of which have already been delivered, putting the greenest buses on the capital's most polluted routes.

<sup>2</sup> Exposure to air pollutants during commuting in London: Are there inequalities among different socio-economic groups? I Rivas, P Kumarab, A Hagen-Zankera, University of Surrey, Environment International, vol. 101, April 2017, p.143-157

<sup>3</sup> London's Polluted Schools: The Social Context, Aether, FIA Foundation, September 2017

The zones are expected to reduce NO<sub>x</sub> emissions by 84 per cent and thousands of school children in these areas will benefit from cleaner air.

- **The Ultra Low Emission Zone (ULEZ)** will supersede the T-Charge, and operate 24 hours a day, 7 days a week within the same area as the current Congestion Charging Zone (CCZ). The world's first Ultra Low Emission Zone (ULEZ) is to start 8 April 2019, approximately 17 months earlier than planned, and create stricter emissions standards for diesel vehicles, 24 hours, 7 days a week. Those that do not comply will face a charge. This is expected to reduce harmful NO<sub>x</sub> (Nitrogen Oxides) emissions by about 50 per cent in central London, 40 per cent in inner London and 30 per cent in outer London.
- **Expanding the ULEZ and tightening the Low Emission Zone (LEZ)** - As part of the Mayor's pledge to help improve air quality and health for all Londoners, he is also proposing to make the London-wide Low Emission Zone (LEZ) stronger, and expand the Ultra Low Emission Zone (ULEZ) requirements for vehicles. This involves introducing a Euro 6 emissions standard London-wide for heavy duty vehicles (i.e. buses, coaches, Heavy Goods Vehicles (HGVs) vehicles) from 26 October 2020, and expanding the ULEZ for light duty vehicles (i.e. cars, vans and motorcycles) so that all vehicles are subject to emissions standards within an area roughly bounded by the North and South Circular Roads from 25 October 2021. The introduction and expansion of the ULEZ, and tightening of the LEZ standards, is forecast to result in a significant reduction in NO<sub>x</sub> emissions across London.
- **London's taxis** – New taxis licensed after 1 January 2018 will need to be zero emission capable to help clean up London's dirty air, with new 'zero emission' ranks for drivers who pioneer green technology alongside a network of rapid electric charge points.
- **Low emission neighbourhoods** – five low emission neighbourhoods have been founded across London to pioneer bold new measures to promote the use of low emission vehicles and improve local air quality, including low emission vehicle only streets, measures to promote deliveries by cycle cargo bikes and low emission vehicles, and bold proposals to promote walking and cycling.
- **The London Environment Strategy** – is a bold and ambitious strategy, with a particular focus on air quality. The strategy seeks to address the most urgent environmental challenges facing our London, to safeguard its environment over the longer term. This is the first strategy to bring together approaches to every aspect of London's environment, including: air quality, green infrastructure, climate change mitigation and energy, waste, adapting to climate change and ambient noise. To make the Mayor's vision of transforming the city's environment a reality, this strategy establishes some key aims for London, which include having the best air quality of any major city, making more than half of London's area green and for tree canopy cover to increase by ten per cent by 2050, and making London a zero carbon city by 2050, with energy efficient buildings, clean transport and clean energy.
- **The Draft London Plan** - published in November 2017, places a considerable emphasis on air quality, with policy S11 stating that London's air quality should be significantly improved, and exposure to poor air quality, especially for vulnerable people, should be reduced. The aim of this policy is to ensure that new developments are designed and built, as far as is possible, to improve local air quality and reduce the extent to which the public are exposed to poor air quality. This means that new developments, as a minimum, must not cause new exceedances of legal air quality standards, or delay the date at which compliance will be achieved in areas that are currently in exceedance of legal limits. Where legal limits are already met, or are predicted to be met at the time of completion, new developments must endeavour to maintain the best



ambient air quality compatible with sustainable development principles. The draft London plan also highlights the importance of creating new, accessible green open space, particularly in areas where this access is lacking. The Mayor is providing funding through his Greener City Fund to create and improve green spaces and to plant trees, including in schools. A proposed new Urban Greening Factor seeks to encourage major new developments to contribute to the greening of London by incorporating measures such as green roofs, tree planting and green walls.

- **Healthy Streets Approach** - the Mayor is embedding the 'Healthy Streets' approach in transport strategy. This promotes a holistic approach that can fulfill multiple objectives such as improving the health, liveability, social cohesion and economic prosperity of an area.
- **The Mayor's Transport Strategy 2018** - The Mayor has set out ambitious plans to improve transport in London over the next 25 years in his draft Transport Strategy, which will act as the backbone of transport planning across London, helping to deliver The Mayor's ambition for 80% of trips in London to be made on foot, by cycle or using public transport by 2041. It includes record investment in new and improved rail, tube and bus services, an unprecedented focus on walking and cycling, and a commitment to make the entire transport system zero-emission by 2050.

### 1.3 THE MAYOR'S SCHOOL AIR QUALITY AUDITS



- 1.3.1. The programme of measures outlined above brought forward by the Mayor, including the potential expansion of the ULEZ and tightening of the LEZ, is forecast to dramatically improve London's air quality, and result in fewer schools suffering from illegal levels of air pollution.
- 1.3.2. However, children's exposure to air pollution will remain an issue, so the Mayor also wanted to take early action at 50 primary schools located in areas with some of the highest air pollution levels, so has provided £250k funding to commission The Mayor of London's School Air Quality Audits programme.
- 1.3.3. The Mayor of London's School Air Quality Audits programme has been commissioned to identify a combination of **hard-hitting measures** and quick-win solutions to minimise the impacts of toxic air

on primary school children in some of the worse affected areas across London. This is both in terms of **reducing the sources** of harmful emissions, as well as **reducing the exposure** to these emissions. The aim is to establish a robust process and toolkit of measures, which the London boroughs and primary schools can roll out, so that every school that is located in an area of high pollution can benefit from this approach.

## 1.4 OBJECTIVES

1.4.1. The key objectives of the Mayor of London's School Air Quality Audit Programme is to:

- Identify the sources of outdoor air quality and potential exposure by primary school children at the school and their surrounding catchment areas, and potential indoor exposure through the internal audits.
- Identify, evaluate and recommend a combination of hard hitting measures and pragmatic approaches, both within and around the school that will help a borough to reduce emissions or reduce primary school children's exposure to poor air quality at those sites, which could be delivered as part of the boroughs' Local Implementation Plan (LIP) funding schemes, as well as other sources of funding such Clinical Commissioning Groups, local businesses and charitable trusts.
- Engage school communities to educate stakeholders about the impacts of air pollution and contribute towards activities, initiatives and policies that the primary school community could implement.
- Engage eligible London boroughs and other relevant stakeholders to inform the feasibility of the proposed recommendations.
- Provide recommendations for the boroughs' consideration and future implementation, and wider dissemination.

## **Chapter 2 – Audit Approach**

## 2 AUDIT APPROACH

### 2.1 PROGRAMME DEVELOPMENT

- 2.1.1. The 'Schools' Air Quality Audits' programme was developed by the GLA's Air Quality team, in partnership with TfL, and in collaboration with the delivery of other TfL/GLA schools' programmes that have an alignment with the objectives of this initiative.
- 2.1.2. The GLA's Air Quality team sits within the GLA's Environment team, and is responsible, amongst other tasks, for the procurement of suppliers to deliver key programmes and associated project delivery tasks.
- 2.1.3. A Project Steering Group (PSG) was established to govern the programme, with representatives from the GLA and TfL.

#### Members of the Programme Steering Group

- Annette Figueiredo- Programme Lead, Principal Policy & Programme Officer, Greater London Authority
- Bruce McVean - Principal Strategy Planner – Walking, Transport for London
- Oli Turk – Schools and Young People Project Manager, Transport for London
- Paula Martin- Air Quality Analyst, Transport for London
- Kate Findlay, City Planner, Transport for London
- Susan Crisp - Schools Places Strategy Delivery Manager, Greater London Authority
- Liz Prosser - Senior Project Officer - Healthy Schools London, Greater London Authority
- Rebecca Roper - Policy & Programme Officer, Greater London Authority
- Ben Connor- Senior Policy & Programmes Officer, Greater London Authority
- Sarah Morris- Graduate Intern, Transport for London
- Robert Sambrooks, Customer Marketing & Behaviour Change Executive, Transport for London

- 2.1.4. The PSG developed the scope for the programme and project brief as part of the tender exercise. Tendering was undertaken via a competitive process, with the chosen supplier (WSP) determined by the GLA in partnership with TfL, on the basis of the most value for money tender.
- 2.1.5. The approved Supplier was then tasked with formalising the audit plan/programme with the PSG, subject to review and approval by the GLA, in partnership with the TfL, and in collaboration with members of the PSG.

**Table 1 – Audit Programme**

Stage	Description	Due Date
Project Team established	Relevant organisations/right skills mix to form the PSG confirmed.	February 2017
Mayor's Approval Form for project delivery	GLA complete internal approval process	April 2017
Engagement with eligible boroughs	Regular communication with borough (air quality and transport) leads through the GLA's links and TfL's STARS established network.	April 2017 onwards

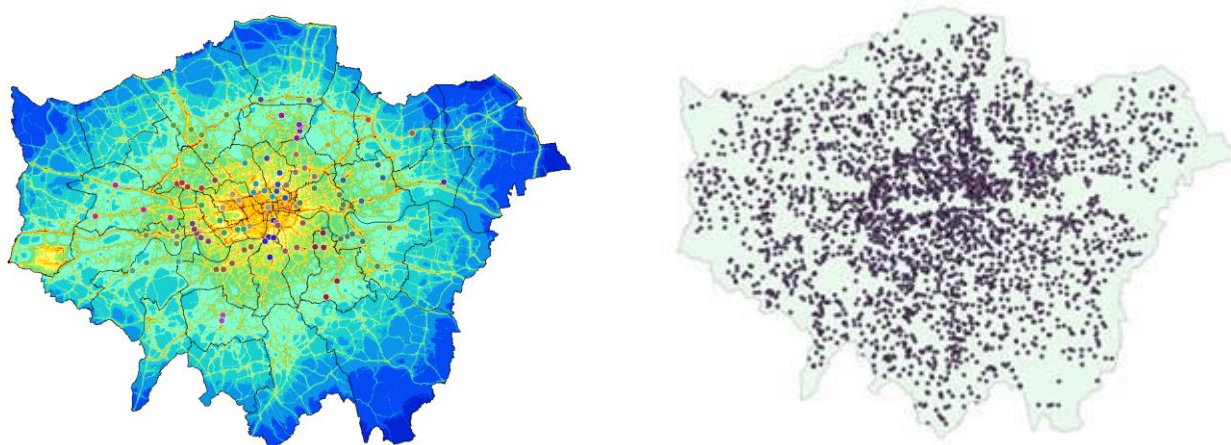
Decision on which primary schools will be involved	Selection criteria established (a total of 25 boroughs were selected as being eligible).	April 2017
Procurement of Supplier	Procurement process completed and a preferred Supplier appointed to carry out the audits.	May/June 2017
Project inception meeting	Inception meeting takes place	July 2017
Engage with primary schools selected	School air quality audits scheduled with 50 selected primary schools.	July – December 2017
Mayoral launch event	The Mayor attended a launch event for the first audit to continue to raise awareness of the issue and promote the audit programme.	September 2017
Audits completed	Primary school air quality audits undertaken/ completed.	September 2017- January 2018
Reporting	Audit reports developed, draft reports circulated to technical stakeholders (boroughs, GLA and TfL) for comment, followed by internal reviews to inform the final edits.	February - May 2018
Publication of the reports announced by the Mayor	The Mayor announces the completion of the audit programme and publicises the availability of the reports, their findings and support materials, to continue to raise awareness of the issue and promote the audit programme.	May 2018
Dissemination of Audit recommendations	Dissemination of the learning and recommendations	June/July 2018

## 2.2 SCHOOL SELECTION PROCESS

2.2.1. The GLA had £250k funding to establish the audit process and complete audits for 50 of the more polluted primary schools. These were selected by the boroughs and GLA from a shortlist of 102 schools, with a total of 25 Boroughs identified as being eligible to apply for audits based on the methodology outlined below.

### School Eligibility

- 2.2.2. To select the schools eligible for the school audit programme, the first stage was to identify the registered educational establishments in London. This was done by using Edubase, a database maintained by the Department of Education.
- 2.2.3. TfL maintain a full, geographically referenced inventory of London's emissions – the London Atmospheric Emissions Inventory (LAEI) model. From which concentrations of each major pollutant are modelled for every street in London. Nitrogen dioxide data was used from LAEI 2013 to measure the NO<sub>2</sub> annual averages per school.



**Figure 3 – School selection methodology – LAEI & Edubase**

- 2.2.4. To calculate the concentration at a particular school, the school's coordinates were plotted and – to take account for the school grounds – an average concentration of the area within 150m radius of that point was calculated. Zonal Statistics were then assessed in GIS to calculate the mean NO<sub>2</sub> concentrations within each buffer area.



**Figure 4 – Buffer zones around school**

- 2.2.5. To select the top 5 schools for each borough, schools with an annual mean NO<sub>2</sub> concentrations 40ug/m<sup>3</sup> were considered, factoring in exposure by considering the maximum number of pupils per school in each borough separately.
- 2.2.6. Other criteria were also considered, such as the proportion of children registered to free school meals, future air quality projections, and spreading the selection of schools across London, so we could account for a range of contexts and settings, e.g. inner city, alongside the north-south circular.
- 2.2.7. Boroughs were asked to submit their applications for selection by close of play on 8th June 2017. The applications required the submission of three documents:

- Written response to the guide questions on no more than 2 sides of A4 paper

- Letters of support from stakeholders (Required as per question 1 in the guide questions)
- Scoring matrix

- 2.2.8. The GLA, working in partnership with TfL, considered the submissions from eligible boroughs and confirmed schools selected for an audit within 4 weeks of the deadline of submission. Eligible boroughs were notified by the GLA via email
- 2.2.9. 25 boroughs were eligible for the audit programme. 80% (20) of eligible boroughs responded with documentation within the designated time and had their selection endorsed by the Project Steering Group (PSG).
- 2.2.10. Three boroughs expressed an interest in the audit programme, but were unable to meet the deadline of the 8th June 2017. The PSG considered the mitigating circumstances justifiable and the deadline was extended to 12:00pm on the 30th June 2017. Due to a decline from two schools, an additional borough, which had been unable to submit their documentation by the original deadline, was also selected. As a result, 24 out of the 25 eligible boroughs had schools shortlisted for auditing.
- 2.2.11. One of the requirements of participation in the programme was that schools sign up to TfL STARS accreditation programme, if they had not already done so, and commit to having an active profile.
- 2.2.12. A further recommendation was that the selected primary schools sign up to the GLA's Healthy Schools' London Programme. Signing up to this Programme would result in co-benefits to children such as improved mental and physical health and well-being.

## 2.3 DEVELOPING THE AUDIT PROCESS

- 2.3.1. Upon their commission WSP were provided with the list of schools selected to form part of the audit programme, following an inception meeting with the PSG, where the approach to delivering the programme was also agreed and to ensure that the outputs and timescales.

### Prepare Audit Plan/Programme

- 2.3.2. An audit programme plan was developed to identify which schools would be audited, how and when the audits will be undertaken, and which WSP staff will undertake each audit. This served as a live document to monitor progress and feedback to the PSG on regular progress meetings.

- 2.3.3. The audit approach can be considered in terms of the following components:

- Technical Content of Audit
- Audit day – scheduling, operations, running times
- Toolkit of Solutions
- Engagement Activities

- 2.3.4. A draft version of the audit approach was developed and consulted on with the PSG and officers from GLA and TfL. The template and process (for the external components) was then trialled at a central and inner London school during the summer holidays (24<sup>th</sup> August 2017), to test the practicalities of completing the forms and referencing the

**SCHOOL AIR QUALITY AUDIT TEMPLATE**

<p><b>School Name:</b></p> <p><b>Address:</b></p> <p><b>Key Telephone Contact:</b></p> <p><b>Key Email Contact:</b></p> <p><b>Head Teacher:</b></p> <p><b>School Staff (name/role):</b></p> <p><b>School Staff (name/role):</b></p> <p><b>School Staff (name/role):</b></p> <p><b>Borough Name:</b></p> <p><b>Sub-region:</b></p> <p><b>Borough AQ Officer:</b></p> <p><b>Borough TP Officer:</b></p> <p><b>Borough School Transport Officer:</b></p> <p><b>WSP Auditor/s:</b></p> <p><b>Background Information</b></p> <p>1. Pupil Numbers:</p> <p>2. Building Description</p> <p>3. School Building Age</p> <p style="margin-left: 20px;">a. Any extensions (building age)</p> <p style="margin-left: 20px;">b. Any planned growth?</p> <p style="margin-left: 20px;">c. BREEM rating (if available)</p> <p>4. Mode share and trip numbers, recent trends</p> <p style="margin-left: 20px;">a. Walk</p> <p style="margin-left: 20px;">b. Cycle</p> <p style="margin-left: 20px;">c. Public Transport</p> <p style="margin-left: 20px;">d. Car</p> <p style="margin-left: 20px;">e. Other</p> <p>5. STARS status:</p>	 <p><b>Audit Date:</b></p> <p><b>Audit Time:</b></p> <p><b>Weather Conditions:</b></p> <p><b>Any exceptional circumstances:</b></p> <p><b>Notable Events/ Traffic incidents:</b></p> <p>6. Local Area Type</p> <p style="margin-left: 20px;">a. City Centre    b. Major Centre    c. Metropolitan Centre</p> <p style="margin-left: 20px;">d. Suburban        e. Residential</p> <p>7. Road Type</p> <p style="margin-left: 20px;">a. T-Box Road</p> <p style="margin-left: 20px;">b. Main Road</p> <p style="margin-left: 20px;">c. Near Main Road</p> <p style="margin-left: 20px;">d. Residential Street</p> <p style="margin-left: 20px;">e. Cul-de-sac</p> <p>8. Street Type (Movement/Place)</p>  <p>9. Proximity to Road</p> <p>Distance to largest adjacent road (m):</p> <p>10. Context: Notes from School/Borough:</p>
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supporting materials on site, and enabled their design to be refined.

2.3.5. A workshop was arranged (31st August 2017) for the proposed audit approach and draft audit template to be presented and consulted on with a sample of borough officers and colleagues from TfL and GLA, with the objective of briefing key technical stakeholders on the proposed approach, and seeking their feedback on:

- Technical Content of Audit - Does our audit approach capture all the necessary information, from various technical perspectives?
- Audit day – scheduling, operations, running times - It is deliverable and achievable in practice – in terms of scheduling and completing the audits on site, working around the schools schedules etc?
- Toolkit of Solutions - Does our toolkit of options cover everything you feel should be included?
- Any feedback on the likely suitability/ effectiveness of solutions?
- Engagement Activities - Any feedback on the suitability/ effectiveness of our proposed engagement activities, any additional factors to consider etc?

**Technical Content of the Audit**

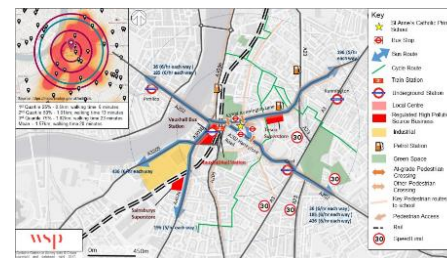
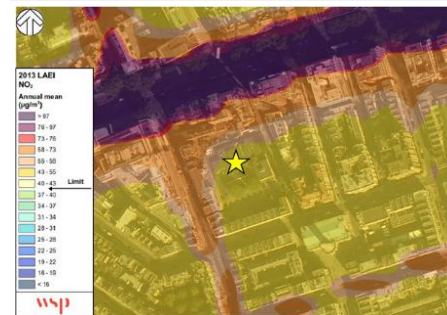
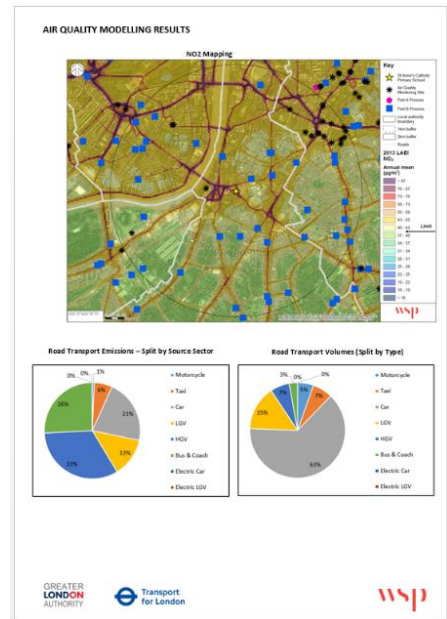
2.3.6. A key element of the project was the development of a robust process for undertaking the audits.

2.3.7. The scope of the audit was agreed and an audit template and checklist were created for use by the auditor when visiting the school, to record observations, contextual information about the school and its environs, and to document the sources of external/internal emissions and exposure.

2.3.8. It was important that a systematic approach was established within the template to ensure observations by auditors were comprehensive and consistent.

**Audit Template**

2.3.9. The front page of the template summarises key contextual





information for reference by the auditor, such as the number of pupils, type of location, street type and the status of the road, a description of the building and its age, an image of the schools entrance, current travel to school mode share figures and the schools STARS<sup>4</sup> accreditations status.

- 2.3.10. It also includes details of the audit day itself, including the date, time, attendees, key contacts, prevailing weather conditions and any notable events or traffic incidents.

#### **Supporting Reference Information**

- 2.3.11. To ensure the auditors were able to make the most effective use of their time on site, preparatory desktop reviews were undertaken to capture as much of the information as possible prior to the site audit, so the auditor was briefed on what to expect and could consider potential areas of interest to investigate whilst on site. It also enabled this material to be sense checked and verified on-site.
- 2.3.12. As part of the desktop review exercise, data sources were interrogated to identify the emission levels and concentrations for each school.
- 2.3.13. These serve to provide important reference information and contextual detail for the area around the school and the wider catchment was also undertaken. This includes:

- Air quality modelling results, including wider area mapping NO<sub>x</sub> concentrations and part A and B processes<sup>5</sup>.
- The composition of local traffic flows on the main roads around the school, and the corresponding road transport emissions by vehicle type, based on the average number of vehicles on each LAEI modelled road link within 200m of the school in the LAEI 2013 base.
- Localised NO<sub>x</sub> concentrations mapping in the area around the school.
- Inner and Outer context mapping of sources of pollution and causes of exposure, and notable features in the local area which may have a bearing on the potential mitigation measures (i.e. bus routes, pedestrian crossing locations, nearby construction sites, physical barriers such as railways or rivers). The coverage and scale of the outer context mapping was determined by the schools catchment area, based on information available through the GLA's School Atlas platform.
- STARS data exports for the school recording activities undertaken at the school and trends in travel to school mode share amongst both children and staff.

- 2.3.14. The contextual information for reference by the auditor is then followed by a series of blank maps and tables to provide the space for them to record comments and observations.

#### **Highways and School Grounds**

- 2.3.15. These are accompanied by checklists and guidance, which served as prompts for the auditor for potential direct or indirect sources of emissions or causes of exposure in and around the school. The checklist items differ slightly between the school grounds and school approaches, with items such as traffic flows and congested junctions for example only applicable outside the school grounds,

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<sup>4</sup> STARS is TfL's accreditation scheme for London schools and nurseries, promoting travel to school sustainably, actively, responsibly and safely by championing walking, scooting and cycling.

<sup>5</sup> Part A and B Processes include regulated industrial installations that have the potential to cause pollution and are required to have an Environmental Permit to operate, including facilities which carry out industrial processes, waste activities, mobile plant and solvent emission activities.

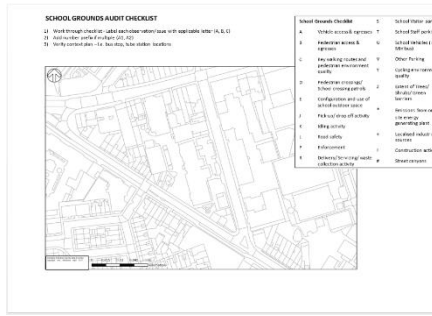
whilst items such as the layout of outdoor spaces at the school only apply within the school grounds. Key pedestrian walking routes however applies both within and outside the school grounds.

2.3.16. The mapping enabled auditors to quickly annotate and reference spatially the observed issues. Each checklist item is labelled with a reference letter/symbol, which can prove helpful as a form of shorthand.

2.3.17. Observations tables were also provided in the template to record notes, which can prove particularly helpful for recording feedback and comments from the school officials, borough officers, parents or other stakeholders whilst undertaking the audit. The tables include columns to identify whether the items are a source of emissions, a cause of exposure, or both, which served as further prompts to ensure the auditors considered the issues in the context of air quality.

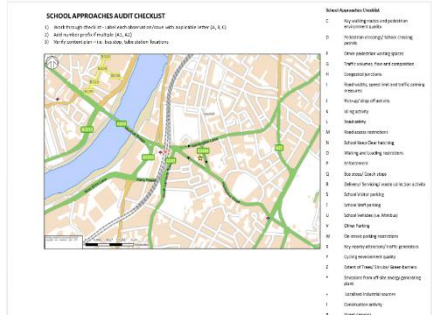
**EXTERNAL CHECKLIST FACTORS – GUIDANCE FOR AUDITORS**

Checklist Factors	Description	School Grounds	School Approaches
A	Vehicle access & egresses Level of activity (links, % of total movements)	x	x
B	Pedestrian access & egresses Level of activity (links, % of total movements)	x	x
C	Key walking routes and pedestrian environment quality Pedestrian routes clear? Footway width (distance of path from carriageway). Barriers/obstacles to walking? Lighting? Public realm quality? Pedestrians from all walks of life? Shade and shelter? Space to stop and rest? Not too noisy? People feel safe? Things to see and do? People feel relaxed?	x	x
D	Pedestrian crossings? School crossing patrol? Proximity to emissions sources? Safety. Convenience. Reduced over-crowding to promote traffic emissions? What user? Maintenance conditions? Pedestrian safety? Accessibility?	x	x
E	Configuration and use of school outdoor space Playgrounds, outdoor spaces. Proximity to emissions sources, particularly where children are exposed for longer durations. Where do children spend time outside during breaks? PE, queuing, off-site? Filter by age groups?	x	x
F	Other pedestrian walking spaces i.e. outside the school gates, other areas children/pedestrians walk	x	x
G	Traffic volumes, flow and composition HGV's? LCV's? Taxis? Nature of this – speed, stop-start?	x	x
H	Congested junctions Congested – resulting in busying vehicles, stop start traffic and additional emissions?	x	x
I	Road widths, speed limit and traffic calming measures Congestion to speeding, long crossing distances? Hostile? Unsafe?	x	x
J	Drop off/pick up activity Drop off/pick up activity	x	x
K	Uphill activity Where do vehicles stop, type, engine age, time, duration	x	x
L	Road safety Island or non-island pedestrian crossings, pedestrian crossings area	x	x
M	Road access restrictions Pedestrian Zones? No Motor Vehicles? Time based access restrictions?	x	x
N	School Keep Clear markings Where? Observed? enforced?	x	x
O	Waiting/Loading restrictions Traffic, double yellow lines? Keep Stop? Signage? How well are restrictions observed/enforced?	x	x
P	Bin stops/ crush stops Where? In school or other? EV's? Taxis, taxis, taxis, goods, children, where do children walk?	x	x
Q	Delivery/parcels/waste collection activity Delivery to school or other? EV's? Taxis, taxis, taxis, goods, children, where do children walk?	x	x
R	School car/park parking Where, how many, vehicles, use, active during visit	x	x
S	School staff parking Where, how many, vehicles, use, active during visit	x	x
T	School vehicles (i.e. minibuses) Where, how many, vehicles, use, active during visit	x	x
U	Delivery/parcels/waste collection activity Delivery to school or other? EV's? Taxis, taxis, taxis, goods, children, where do children walk?	x	x
V	On-street parking restrictions Resident Permit holder only? Business Permit holder? P-03? Unrestricted?	x	x
W	Key nearby attractions/traffic generators i.e. employment, supermarkets, shops, stations	x	x
X	Cycling environment quality Evidence of demand? Cycle friendly/hostile? Cycle routes?	x	x
Y	Extent of Road Works/Street closures Presence of planting and screening from roads	x	x
Z	Emissions from on-site off-site energy generating plant Gas-fired boilers and CHP units	x	x
AA	Localised industrial sources Look out for additional plant & sources not mapped – i.e. Dry cleaners, laundries, etc. Car parks – parking cars	x	x
AB	Construction activity Are there any construction sites? Construction traffic routing? Visible dust? Visible dust suppression/monitoring in place?	x	x
AC	Street canyon Where walking height on both sides of the road is greater than road width	x	x



**SCHOOL GROUNDS OBSERVATION NOTES**

Source	Exposure	Feedback Notes
(i.e. factors influencing emission of harmful emissions)	(i.e. factors influencing exposure of children through an area, or walking in an area)	(i.e. from consultations, during observations/brainstorming session)



**SCHOOL APPROACHES OBSERVATION NOTES**

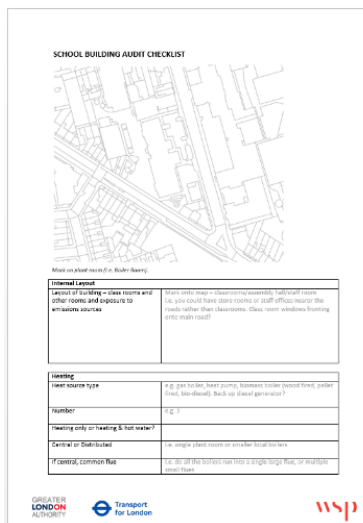
Source	Exposure	Feedback Notes
(i.e. factors influencing emission of harmful emissions)	(i.e. factors influencing exposure of children through an area, or walking in an area)	(i.e. from consultations, during observations/brainstorming session)

**School Building**

2.3.18. The school building audit forms included an outline map of the building for the auditors to record the location of the plant rooms/ boiler rooms and the locations of their flues, and notable features about the layout of building, such as where class rooms are more exposed to emissions sources.

2.3.19. A series of checklist items for completion follow, with prompts and guidance to aid the auditor, as well as the bursar or caretaker if pre-completing ahead of the audit. These include:

- Internal layout – class rooms and



**Boiler Room**

Boiler type

Boiler manufacturer

Boiler model

Boiler rating (kw output)

Boiler structure of rating plate

Boiler condition

Supply tank/vented?

Boiler control system

Air Conditioning?

Local heaters?

Air flow used?

Flues, what type?

Flue course

Flue access

Flue access to outside building?

Control system

Maintenance Requirements

other rooms and exposure to emissions sources


- Heating –i.e. heat source types, numbers, locations, flue heights, boiler condition
- Ventilation – i.e. form of ventilation (passive (windows) or centralised (air handling units)), windows opening onto main roads/ emission sources

**Stakeholder Discussion Points**

2.3.20. This section provided a structured set of discussion points to be worked through by the auditor with the key technical stakeholder representatives from the borough council and school as part of the brainstorming sessions on the day of the audit.

2.3.21. Amongst the questions and discussion points the auditor sought to understand:

- How representative the day has been of a typical day, and how conditions or behaviours observed vary by time of day and over the year.
- Trends or issues in terms of pupil numbers, catchments, travel behaviours
- Key initiatives planned and underway
- Key measures from the discussion that stakeholders would prioritise for the school
- Possible local funding sources
- Whether there is any planned growth at the school (in terms of number of pupils or the school building)
- Notable committed or proposed developments or transport schemes planned in the local area
- Understanding of air quality issues amongst the children, parents and teachers.
- Awareness of air quality related lesson materials available

<b>Ventilation</b>	
Form	Is ventilation gas handling units, ceiling fans/extractors
If window that	Do any of the windows address issues that require special fire protection or cooling controls, heat and pollution controls (if any)?
If centralised system then	Is it handling units?
	
Air Handling Units a) All heating and air flow is from the unit b) No flow into the room from other sources c) No flow out d) No flow in/out e) No flow in/out f) No flow in/out g) No flow in/out h) No flow in/out i) No flow in/out j) No flow in/out k) No flow in/out l) No flow in/out m) No flow in/out n) No flow in/out o) No flow in/out p) No flow in/out q) No flow in/out r) No flow in/out s) No flow in/out t) No flow in/out u) No flow in/out v) No flow in/out w) No flow in/out x) No flow in/out y) No flow in/out z) No flow in/out	
Hot from boiler or direct fire?	
Filters in place and changed regularly?	Check from log this filters history, changed at 600 hours & monthly or on pressure difference
Air intake location?	Top level?
Air intake location?	Clear of other vents, heat sources, exhaust outlets?
Speed of movement of system?	Speed to ground level, average, adequate?
Control fan/stoppage?	
Maintenance of extract fan?	Is fan working?

Control system?	Manual, automatic, building management system?
Variable speed supply & extract?	Speed control on thermal coil based on temperature?
<b>Hot Water</b>	
Same as above or separate system?	
If separate:	
Gas or electric?	
Control or local?	Is there a gas control system or tank of local local water?
Control system?	Is there a gas control system or tank of local local water?
Hot Water?	Is there a gas control system or tank of local local water?
<b>Boilers</b>	
Boilers located in plant?	What does boiler plant look like?
Extract fan?	Should not be used
Flue gas?	Should use local flues for gas if above table
Control system?	Should not be used control?
<b>Internal conditions</b>	
Incidence of overheating?	Overheating/overheating a temperature
Fresh air?	Clear of heat, "usually" need more than air?
Stew plants within building?	Is it, where?
Damp or mould present?	Is it, where and to what extent?
<b>Comments</b>	

**STAKEHOLDER DISCUSSION POINTS:**

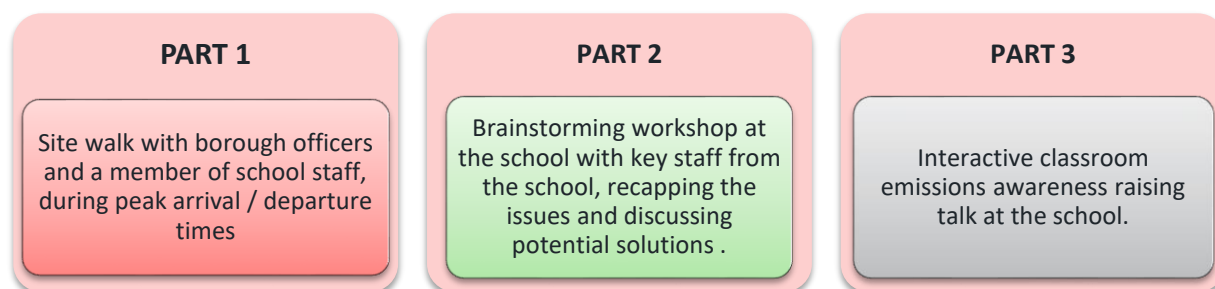
- 1) Is there anything you would like to add or comment on regarding our recorded observations? Where do children spend time outside, during breaks, PE, leaving off site? (Offer to sign group?)
- 2) Any comments on recent trends/issues regarding travel to school? Travel patterns of children and parents etc.
- 3) What do you feel are likely to be key sources of emissions in and around the school?
- 4) Where do you feel exposure to poor air quality is greatest in and around the school?
- 5) Key initiatives already underway to promote sustainable travel and reduce emissions? Which have worked well? Which haven't?
- 6) What more could the school do to lessen incidents of exposure and reduce sources of emissions?
- 7) Based on the results of measures, and the findings of the observations and analysis, what are the top 3 measures you would prioritise for the school?
- 8) What sources of funding do you feel may be available to contribute towards localised schemes to address poor air quality at the school?
- 9) Is there any planned growth at the school (in terms of number of pupils or the school building/ grounds)?
- 10) Are there any notable committed developments planned in the local area?
- 11) To what extent do you feel issues relating to air quality are well understood by the children, parents, teachers, local community, through officers and decision-makers?
- 12) Are you aware of the air quality related lesson materials available?
- 13) Are other activities or behaviours not observed today you would wish to highlight?
- 14) Can you provide us with a copy of the debriefing log for the week of the audit?

**STAKEHOLDER FEEDBACK NOTES:**

### Audit day - Fieldwork

2.3.22. The approach taken in carrying out the audit comprised of several elements, including the visit to the school by the WSP auditor and officers at the borough who deal with air quality, transport planning and school travel. A key element of the audits was to capture the views of school staff, wider school community and relevant borough officers, in understanding operational considerations, behavioural traits and recent history of the school. As such, we proposed a three-fold approach summarised below:

**Figure 5 – Key elements of the Audit**



### Audit Day Planning

2.3.23. An indicative audit day schedule was developed and consulted on with GLA and TfL staff and a sample of borough officers drawn across a range of technical backgrounds were brought together for a workshop on 31<sup>st</sup> August 2017. The stages of the audit to be completed were as follows:

- **Initial observations** and site familiarisation, and registration/ introductions (approx. 30 mins)
- **Site walk and observations during either peak arrival or peak departure times** with borough travel plan coordinator/transport officer and school staff (approx. 30 mins)
- **Engagement Activities** to raise awareness of air quality issues with the children (approx. 30 mins)
- **Internal Audit of building and school grounds** accompanied by the bursar/caretaker or nominated staff (approx. 60 mins)
- **Brainstorming workshop** with key staff from the school (i.e. head teachers, school travel champions), plus borough officers (air quality, school travel plan officer, transport officer). Beginning by recapping the issues observed/ reported, and discussing their aspirations and potential solutions and preferences, and to understand operational considerations, behavioural traits and recent history of the school. (approx. 90 mins)
- **Further observations and completion of site audit template** by WSP auditor (approx. 60 mins)

2.3.24. The table below provides an example of a typical audit schedule.

**Table 2 – Audit Details**

Timings	Description
0800 - 0830hrs	Initial observations and site familiarisation by WSP auditors
0830 – 0900hrs	Site walk and observations with borough travel plan coordinator/ air quality officer/ transport planner and school staff
0900 – 0930hrs	Internal site walk to appreciate the layout of the building/playgrounds etc.
0930 – 1100hrs	Brainstorming Workshop
1100 – 1130hrs	Engagement activity – interactive presentation at school assembly/ school council/ school class
1130 - 1230hrs	School Building audit

- 2.3.25. The audits must be scheduled around either the school start or finish times, to enable the auditor to observe the key periods of activity around these times, such as pick up and drop off activity around the school, the routes children approach the school from and their resultant exposure to emissions, and the general conditions around the school at these times.
- 2.3.26. A key consideration in planning the audits was a recognition that school staff are often highly time constrained, so it was important to be clear and succinct in our requests for inputs, so as to prioritise the most critical information. It was important that the audit schedule was developed in a way that would ensure the necessary information was collected and observations recorded, whilst also adapting and working flexibly around the operations of the school and the availability of key representatives from the school and borough. For example if the Headteacher or other key staff were only available for the brainstorming earlier in the day, this could be brought forwards, or if the assemblies were typically scheduled for a certain time the various stages of the audit could be reordered to align with these timings. It was also recognised that it may be necessary for the engagement activity to be delivered in a variety of formats to suit the school, including full school assemblies, to classroom activities, or to school councils or equivalent pupil groups spanning a range of age groups.
- 2.3.27. In addition some components of the audit were supplied to the school/ borough contacts in advance, to enable attendees to have considered their answers, and circulate them for input from others unable to attend on the day. The school building audit typically needed to be completed by the school bursar/ porter/ caretaker, and was well suited for completion in advance if they were unable to attend or to save time on the day.

### Audit Day Content

2.3.28. Initial observations and site familiarisation were undertaken by the auditor prior to the school opening. This allowed them to sense check the context maps compiled initially from desktop assessments. Observations with the borough officers and school staff were then undertaken throughout the period of drop-off and waiting activity, prior to the school gates opening, and until parents have dispersed. During this critical period the auditors captured as much information as possible on activity in and around the school, with comprehensive photo records and discussions with the school staff to capture issues which may often occur but were not evident during our observations, The external observations were then followed by a walk around the school building and grounds, to enable the auditor to familiarise themselves with its layout, and the proximity of classrooms, nurseries, playgrounds etc to areas of poor air quality.



- 2.3.29. A brainstorming session was then undertaken, with key staff from the school and the borough officers in attendance. This session served several functions. It enabled the auditor to capture additional information on other issues and concerns not observed directly, and additional information on issues such as whether there are any plans for extensions or additional pupil intake for example. Whilst from the borough officers we were able to establish what planned or committed development is nearby, proposed or previously considered transport schemes etc. We then discussed a range of potential measures to address the issues, and collected feedback and suggestions from the borough and school representatives to inform the recommended measures.
- 2.3.30. An interactive and bespoke engagement activity was then delivered to a school assembly/ school council/ school class, using presentation slides to raise awareness of air pollution, its causes, the health impact, areas of pollution near the school and a range of measures to reduce air pollution.
- 2.3.31. An audit of the building was then undertaken with the assistance of the facilities manager, including a review of the school's boilers, their flues, the ventilation systems and kitchen extraction.
- 2.3.32. Following the audit the auditor reviewed the findings of the audit and preparatory assessments, with the specialist support of air quality, transport planning and buildings specialists, to develop advice and recommendations, based on a toolkit of best practice measures and case study examples.

### Engagement Activities

- 2.3.33. To inform the approach to raising awareness amongst the children and wider stakeholders, a bespoke interactive presentation, poster and supporting materials for a lesson plan on air quality were developed.



### Interactive Presentation

- 2.3.34. A key consideration in developing the presentations was to ensure they were bespoke to each school, and were engaging and interactive, allowing for a good level of active engagement from the children.
- 2.3.35. The presentation was also developed to be applicable for both KS1 and KS2 children, to allow for the school to select whether they would prefer it to be delivered as part of full school assembly with both age groups, or a single classroom activity, or a mix of ages, such as school council or equivalent.
- 2.3.36. The presentation was developed as a series of questions posed to the children, promoting responses and discussion, then followed by a reveal of a series of images to convey the answers, which were then discussed by the auditor, and could be pitched to suit the age group. The presentation slides covered:
- What is air pollution?
  - What makes air dirty?
  - What impact does poor air quality have?
  - Where do you think you are most exposed to poor air quality?
  - How do you travel to school?
  - What can be done to improve air quality?
  - Who can make this happen?
- 2.3.37. The bespoke element of the presentation featured an aerial image of the particular school at which the audit was taking place, with the children asked which of 3 locations (A, B or C) they felt was most polluted, based on the preceding discussion about the sources of air pollution.
- 2.3.38. This was followed by a hands up survey of how the children travelled to school, which enabled auditors to sense check the data provided on mode of travel to school, whilst also enabling the children to consider how their own mode of travel to school may affect local air quality.
- 2.3.39. The presentation concluded by asking the children if they had learnt about air quality, and who could make a difference in implementing some of the solutions discussed.

### Lesson Plan

- 2.3.40. To inform the development of a lesson plan, a review of currently available lesson plan material on the topic of air quality for KS1/KS2 children was undertaken. This found that a significant amount of material has recently been produced that teachers can use to promote understanding of the causes

and impacts of air pollution. These include National Clean Air Day lesson plan toolkits, and the programme of lesson developed by LSx, as part of the LSx Toolkit, which have been well received by both schools and pupils, and furthermore have recently been updated.

2.3.41. As such it was concluded that the outputs of this study could be used to add value to the existing lesson plans, by providing bespoke outputs from each audit so they could be tailored to be specific to each of the schools.



London Sustainability Exchange

2.3.42. The following lesson was identified as being particularly well suited to incorporating elements of the audits, and enhancing the lesson by doing so.

### **LSx Part 2 Lesson Plan (pg14) - Investigating Air Quality**

The objectives of this lesson plan includes:

- collecting scientific evidence
- using scientific equipment
- carrying out fieldwork investigations
- making a labelled field sketch.

Links to National Curriculum:

- Science
- Geography

Outcomes:

- Raising Awareness

2.3.43. The bespoke air quality modelling outputs for each school were extracted and adapted into child friendly format, and made available for use in conjunction with these lessons, and can be used to summarise the 'baseline' conditions prior to any measures being implemented, and to identifying areas to target fieldwork investigations.

2.3.44. A further lesson could also be undertaken post implementation of some of the measures, to evaluate the impacts the various measures have had on air quality.

2.3.45. It is proposed that the lessons are delivered by teaching staff as part of a wider programme of air quality initiatives, such as National Clean Air Day, or other local initiatives such as Lambeth Clean Air Week, to reinforce the message further.

### **Poster**

2.3.46. A poster was also developed to highlight the issue of poor air quality, the causes, the impacts, and the types of measures that can have a positive impact on reducing poor air quality. The poster was designed in a format / style that is easy to understand and digested by younger children.

2.3.47. The poster has been developed to be displayed in conjunction with the delivery of the associated lessons/ activities as part of an event such as National Clean Air Day.

### **London Curriculum**

2.3.48. The above engagement materials were developed with The GLA Education & Youth Team, to support and complement their parallel development of a new air pollution component to the London



Curriculum, which will serve to draw together already available lesson materials and highlight the key material schools should focus on delivering.

- 2.3.49. As part of the audits a note prepared by London Curriculum was also provided to the school staff. The note introduced their plans for a new programme of targeted activity to be delivered through the London Curriculum, with a focus on supporting teacher subject knowledge and confidence to tackle air quality as a science subject, recognising that this requires a wide knowledge and skill base of science, statistics and mapping. The note also highlighted activities associated with the programme and helpful web links to London Curriculum partners, including:

- Royal Geographical Society (with IBG) - <http://www.rgs.org/OurWork/Schools/Schools+and+education.htm>
- ESRI - <http://www.esri.com/industries/education/software-bundle#>
- IRIS The Institute for Research in Schools - <http://www.researchinschools.org/staff.html>
- STEM Learning - <https://www.stem.org.uk/stem-ambassador-hub-london>

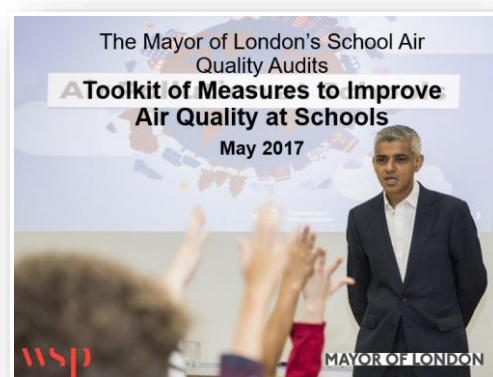
### Toolkit of Solutions

- 2.3.50. A toolkit of measures for addressing air quality issues was developed for use in informing our recommendations for each school.

- 2.3.51. A range of recommendations were identified, drawn from a comprehensive toolkit of measures developed as part of the project. The toolkit was compiled from a review of best practice approaches and new technologies, including both well established and simple measures, and more innovative or harder hitting solutions. These include both physical and behavioural measures.

- 2.3.52. The toolkit is multi-disciplinary and holistic in its approach, as promoted by the Healthy Streets approach, in seeking to address a broad range of factors which each influence how streets are used, how people travel and consequently how clean the air is in and around the school. Each measure was been assessed against a series of key criteria, including the potential air quality improvement, wider benefits, cost, deliverability and likely stakeholder support.

- 2.3.53. The toolkit of measures and audit templates will serve as a repeatable good practice approach, but are also intended to be live documents, to build on our knowledge of how effective different measures prove to be over time, allowing the toolkit to be continually refined for future audits. As such, the reports also include guidance for monitoring pre and post implementation.

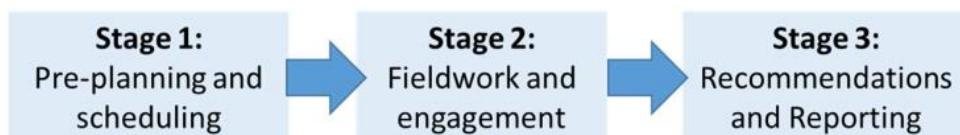


## **Chapter 3 – Programme Delivery**

### 3 PROGRAMME DELIVERY

- 3.1.1. The Mayor of London's School Air Quality Audits were delivered following a structured approach, summarised in Figure 6. Each audit consists of broadly three stages:

**Figure 6 – Overview of Approach**



#### **Pre-planning and scheduling**

- 3.1.2. The borough air quality primary contacts were contacted by the lead Auditor, and a range of mutually available potential dates for the audit were agreed, with the borough officer also tasked with consulting with colleagues in other departments, including transport planning and school travel officers. The borough then introduced the auditor to the school, and a date and schedule for the tasks to be undertaken was agreed, to fit in with the operations of the school and availability of key staff contributing to the audit, taking the indicative schedule presented in Chapter 2 as a starting point.
- 3.1.3. Whilst agreeing the running order for the day with the school, their preferences in terms of the engagement activities, timings etc, copies of the discussions points note and building audit form were provided in advance, which could then be completed beforehand or on the day by the auditor. The school were also asked to notify parents in advance that the audit would be taking place to allay any concerns from parents on the day, although the auditors would also be accompanied by a member of staff at all times.
- 3.1.4. The programme of 50 schools was divided into three batches, with the first batch of schools contacted soon after the project inception meeting in July, so the audits could commence from early September, in order to meet the objective for completing the full programme of audits by end of the autumn term (mid-December).
- 3.1.5. The batch two schools were contacted in late September, followed by the batch three schools from the autumn half term onwards, all with a view to scheduling the audits to be completed before the end of December.
- 3.1.6. Prior to the audit air quality modelling was undertaken for the area around the school, with an assessment of the contribution to emissions made by each vehicle type on the roads around the school. A desktop review of the local areas around the school site, and the wider catchment was also undertaken, to highlight key features for the auditor to assess further on site. Engagement materials were developed for use in delivering bespoke awareness raising interactive presentations to the children. A toolkit of measures for addressing air quality issues was developed for use in informing our recommendations for each school.
- 3.1.7. All auditors were thoroughly briefed and participated in the trial audit for the draft template, and a pilot audit using the finalised audit templates. An audit risk assessment was completed prior to each audit to consider any risks associated with the delivery of the audit, including any specific risks associated with each school site, with suitable mitigation measures identified where required.

**Fieldwork and engagement**

- 3.1.8. The fieldwork component of the programme included the audit, undertaken by the WSP auditor with officers from the borough council who deal with air quality, transport planning and school travel and school representatives, and the awareness raising engagement activity with the children.
- 3.1.9. The programme of 50 air quality audits was completed in full, with 49 of the schools audits by the end of December, and one further school completed in January, see Table 3 below for a full record of the schools audited as part of the programme, the borough and sub-region they are located in, and the date of the audit.
- 3.1.10. In a small number of instances (4) it was not possible to schedule a date with a school selected amongst the original 50 shortlisted schools, either because the school no longer wished to participate or was not able to commit to a date within the audit programme timescales. In these circumstances the PSG identified a replacement school from the reserve list of applicants.

**Table 3 – School Air Quality Audits**

	<b>Sub-Region</b>	<b>Borough</b>	<b>School</b>	<b>Audit Date</b>
1	Central London	Camden	Christopher Hatton Primary School	25-Sep
2	Central London	Camden	Gospel Oak Primary School	04-Dec
3	Central London	Camden	Netley Primary School	28-Nov
4	Central London	Kensington and Chelsea	Holy Trinity CofE Primary School	25-Sep
5	Central London	Kensington and Chelsea	Oxford Gardens Primary School	05-Dec
6	Central London	Kensington and Chelsea	St Mary Abbots CofE Primary School	28-Nov
7	Central London	Tower Hamlets	Bonner Primary School	06-Nov
8	Central London	Tower Hamlets	Marners Primary	19-Dec
9	Central London	Westminster	Hallfield Primary School	23-Jan
10	Central London	Westminster	St Clement Danes CofE Primary School	03-Nov
11	Central London	Westminster	St Mary's Bryanston Square CofE School	26-Sep
12	Central	Westminster	St Peter's Eaton Square CofE Primary School	13-Dec

THE MAYOR'S SCHOOL AIR QUALITY AUDIT PROGRAMME

	London			
13	East London	Barking and Dagenham	St Peter's Catholic Primary School	12-Dec
14	East London	Greenwich	Haimo Primary School	06-Dec
15	East London	Greenwich	Invicta Primary School	16-Nov
16	East London	Newham	Keir Hardie Primary School	23-Nov
17	East London	Newham	Salisbury Primary School	29-Nov
18	East London	Redbridge	Oakdale Junior School	12-Dec
19	East London	Redbridge	William Torbitt Primary School	11-Dec
20	North London	Barnet	Tudor Primary School	02-Nov
21	North London	Barnet	Wessex Gardens Primary School	07-Dec
22	North London	Enfield	Bowes Primary School	08-Nov
23	North London	Hackney	De Beauvoir Primary School	15-Nov
24	North London	Hackney	William Patten Primary School	17-Oct
25	North London	Haringey	Holy Trinity CofE Primary School	30-Nov
26	North London	Haringey	Lordship Lane Primary School	16-Oct
27	North London	Haringey	Welbourne Primary School	11-Dec
28	North London	Islington	Prior Weston Primary School and Children's Centre	07-Dec
29	South London	Lambeth	St Anne's Catholic Primary School	21-Sep
30	South London	Lambeth	Stockwell Primary School	16-Nov
31	South London	Lewisham	Deptford Park Primary School	04-Oct
32	South London	Lewisham	Haseltine Primary School	16-Oct
33	South London	Lewisham	St James's Hatcham Church of England Primary School	24-Nov
34	South London	Merton	Merton Abbey Primary School	24-Nov
35	South London	Southwark	Charlotte Sharman Primary School	11-Oct
36	South London	Southwark	Oliver Goldsmith Primary School	12-Dec
37	South London	Wandsworth	Chesterton Primary School	20-Nov
38	South London	Wandsworth	St Anne's CofE Primary School	10-Nov
39	South London	Wandsworth	St Mary's RC Voluntary Aided Primary School	19-Oct
40	West London	Brent	Ark Franklin Primary Academy	11-Dec
41	West London	Brent	John Keble CofE Primary School	20-Nov

42	West London	Ealing	Ark Byron Primary Academy	12-Dec
43	West London	Ealing	Christ the Saviour Church of England Primary School	04-Dec
44	West London	Hammersmith and Fulham	Melcombe Primary School	01-Dec
45	West London	Hammersmith and Fulham	St Paul's CofE Primary School	16-Oct
46	West London	Hounslow	Cavendish Primary School	15-Dec
47	West London	Hounslow	St. Mary's Catholic Primary School	08-Nov
48	West London	Hounslow	The William Hogarth Primary School	14-Nov
49	West London	Richmond upon Thames	East Sheen Primary School	30-Nov
50	West London	Richmond upon Thames	St Stephen's Church of England Primary School Richmond	18-Oct

### Recommendations and Reporting

- 3.1.11. The auditor reviewed the findings of the audit and preparatory assessments, with the specialist support of air quality, transport planning and buildings specialists, to develop the recommendations, based on a toolkit of best practice measures and case study examples.
- 3.1.12. A draft template and format for the summary school audit reports was developed in December 2017 for the reporting the findings of the school audits, with the PSG and wider GLA and TfL colleagues consulted to inform the final template.
- 3.1.13. Following the completion of the audits, a report was drafted for each of the schools, developed in batches in a similar format to that taken when scheduling the audits. Draft reports were consulted on with technical stakeholders, including the borough officers, who were invited to provide any further comments on any factual inaccuracies, additional planned schemes or initiatives or wider contextual information not picked up in the audit discussions, and colleagues from the GLA and TfL. Comments were also invited on the draft recommendations proposed, although it was made clear that it was felt essential that the audits remained independent, and so whilst views were sought and comments invited, it was made clear that recommendations would ultimately be independent.
- 3.1.14. The initial project timescales were revised in order to undertake this extended period of consultation, with the deadline for final feedback on the last batch of summary audit reports set for April 2018, following which the reports were finalised ahead of high-profile presentation event to announce the completion of the programme and the wider publication of the reports in May 2018, with a view to continuing to keep the issue of air quality in the headlines and serve as a driver for change.
- 3.1.15. A series of presentations were then planned with schools and boroughs invited to hear the findings of the study and the recommendations, as well as a discussion of the next steps, including the delivery of the recommendations, funding opportunities and monitoring.

## **Chapter 4 – Context and Initiatives**

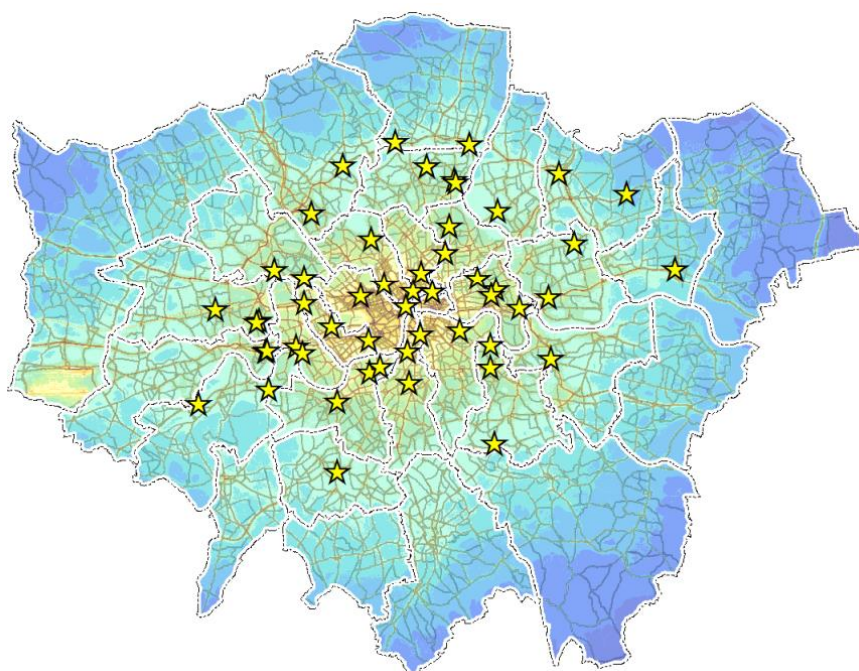
## 4 CONTEXT AND INITIATIVES

### 4.1 SCHOOL CONTEXT

4.1.1. Each of the schools audited as part of the programme had its own particular characteristics. In order to assess the sources of emission and exposure at each of the schools, and develop a suitable package of recommendations, it was important for the auditors to appreciate the local context of the school, and any plans for committed or planned new developments, construction, transport schemes and initiatives, as well as any planned changes to the school building or grounds, or in terms of the pupil numbers.

4.1.2. At a programme level the some of the more notable contextual information for the 50 schools is summarised below:

**Figure 7 – Location of the School Air Quality Audit Programme Schools and 2013 LAEI baseline annual mean NO<sub>2</sub> concentrations**



#### Proximity to busy roads

- The majority of schools were located on or near to a busy road – with 37% of the schools were located on a major road, and a further 53% located near a major road. The remaining 10% were set back from main roads, but were still subject to high levels of air pollution.

#### Traffic volumes

- The average volume of daily traffic movements<sup>6</sup> on the main roads around the schools was 17,750, though this varied considerably, with the highest being 47,300 average vehicle movements per day, and the lowest being 1,200.

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<sup>6</sup> The traffic flows and vehicle splits presented are based on the average number of vehicles on each LAEI modelled road link within 200m of the school in the LAEI 2013 base.



### Large share of pollution from buses and lorries

- The composition of traffic around the schools also had a significant bearing on emissions levels and the subsequent recommendations. On average across the programme, 66% of the vehicle movements near schools were cars, 13% vans, 7% taxis, 5% lorries, 5% buses and coaches and 4% motorcycles.
- However the contribution of the more polluting vehicles, including larger vehicles such as lorries, buses and coaches, and those vehicles more likely to be older diesel vehicles, such as vans and taxis, is disproportionately high relative to their numbers as part of the overall traffic flows.
- On average across the programme buses and coaches made up 32% of road based emissions for traffic on main roads near the school, followed by cars on 26% and lorries on 22%.
- In some cases buses and coaches contributed up to 66% of road based emissions.
- Whilst in areas with higher levels of freight activity, lorries contributed up to 50% of road based emissions.

### Travel to school mode shares

- The mode of travel to school was another significant factor in informing the recommendations, as whilst the number of parents picking-up and dropping off their children by car, and their associated contribution to emissions, will be negligible compared to the volume of passing traffic and background emissions, they are likely to be in close proximity to more concentrated numbers of children. Equally any measures to promote greater travel by sustainable modes amongst parents who currently drive may serve to affect wider changes in travel behaviours beyond the school run.
- On average across the schools audited 51% of children walked to school, with 19% travelling by car, 16% by public transport, 10% other (which was typically by scooter, though sometimes by park and stride or car sharing), and 3% by cycling.
- These figures varied significantly however from school to school as would be expected, with catchment areas, the availability of public transport and the availability of parking all key determinants.
- In some instances as many of as 86% of children walked to school, whilst elsewhere only 26% walked.
- The highest levels of travel to school by car were 36%, whilst the lowest was 3%. This corresponds with the significant variances in the number of cars parking and idling close to the school.

### School Catchment areas

- The catchment areas of the schools also varied significantly, with some nearly exclusively drawing children from their local area, whilst others, such as some of the voluntary and faith based schools, have much wider catchment areas.
- On average children lived within a 17 minute walking distance from the school<sup>7</sup>.
- The longest mean walking time for children was 52 minutes, where clearly the potential for travel by walking, scoot and cycling as a primary mode of travel will be limited.

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<sup>7</sup> School catchment walking distance figures based on the GLA School Atlas mean walk distance data for 2016 - <https://maps.london.gov.uk/schools/>

- The shortest mean walking time distance was 5 minutes.

#### **Number of children**

- The number of children at the 50 schools audited as part of this programme ranged from 784 at largest to 165 at the smallest, and averaged 417.

#### **Air quality levels**

- The levels of air pollution, in this case measured as annual mean nitrogen dioxide (NO<sub>2</sub>) concentrations<sup>8</sup>, within the vicinity of schools ranged from 67µg/m<sup>3</sup> in the most polluted areas to 40µg/m<sup>3</sup> at lesser polluted sites.
- The average across the 50 schools was 45µg/m<sup>3</sup>. The legal limit for nitrogen dioxide set by the EU is 40mg/m<sup>3</sup>

#### **Inequality issues**

- In London poor air quality is also known to disproportionately affect lower socio-economic groups, with a clear link between exposure and deprivation. Previous research has found that approximately 80% of primary schools above the legal limit are deprived schools.
- On average 23% of the children attending the 50 schools audited as part of this programme qualified for free school meals. In some cases this was as high as 43%, though at other schools in the programme it was as low as 3%.

#### **Engagement with STARS and Healthy Schools London schemes**

- The extent to which schools are actively engaged in schemes like STARS and Healthy Schools London is also helpful in providing an indication as to the likely levels of awareness and activity in promoting sustainable travel to school, healthy lifestyles and air quality issues.
- 68% of schools in the programme were engaged in STARS, with 30% of schools having achieved gold accreditation status.
- 50% of schools were engaged with Healthy Schools London, though only 4% had achieved gold accreditation.

## **4.2 PLANNED SCHEMES & RECENT INITIATIVES**

- 4.2.1. A range of locally significant planned new developments, construction sites, transport schemes or initiatives were identified around each school, with the help of the borough officers and school representatives in attendance as part of the audit brain-storming session and subsequent invitations for feedback on the draft reports.
- 4.2.2. The extent of local planned or ongoing construction activity and new development varied throughout the schools in the programme. In some cases the schools were situated in or around major zones for regeneration, where significant amounts of construction activity was taking place, such as the schools in and around the Nine Elms area. In examples like this the auditors will have sought to account for the impacts of construction and freight traffic volumes, including the vehicle emissions and dust from the site, as well as construction equipment like Non-Road Mobile Machinery. They would also seek to account for the longer term changes and opportunities these redevelopments

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<sup>8</sup> 2013 LAEI baseline

may offer, where for example the redevelopments will also deliver improvements in accessibility to public transport, and a reallocation of roads away from private cars. These measures can serve to transform the character of the area, and consequentially travel behaviours and road transport emissions, and may also present more opportunities to travel to school by sustainable modes or via less polluted routes.

**Wider Measures**

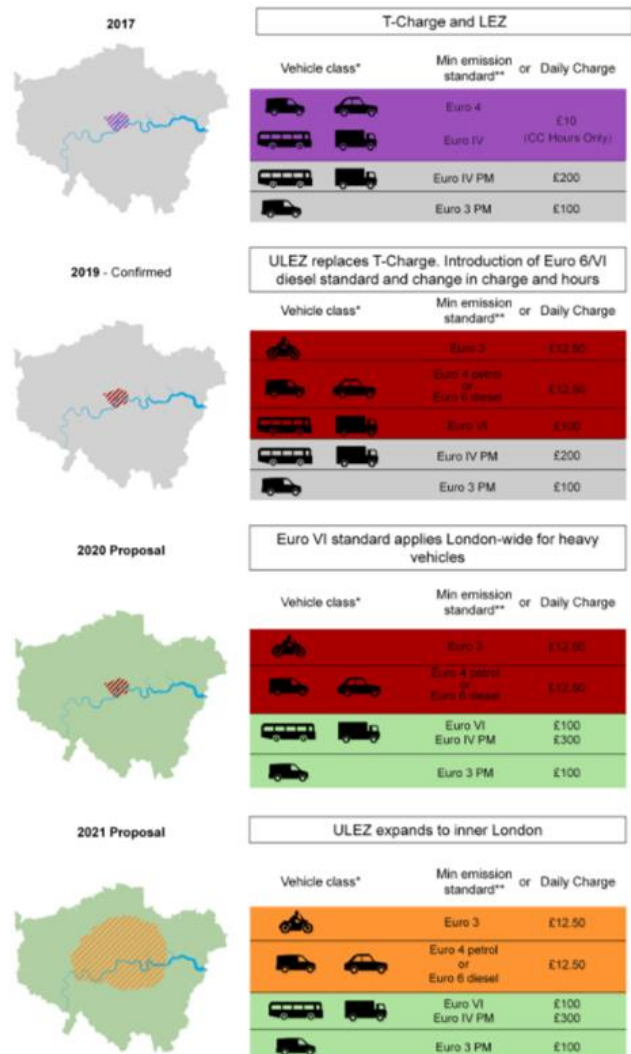
4.2.3. Amongst the planned local transport schemes and initiatives identified during the audits, a number of notable transport schemes were found to reoccur across a number of school areas. These comprised a range of physical schemes and behavioural measures, including the:

- Ultra-Low Emission Zone (ULEZ) and Low Emission Zone (LEZ)
- Low Emission Bus Zones (LEBZs)
- Cycle route improvement schemes
- Low Emission Neighbourhood (LENs)
- STARS
- Health Schools London (HSL)

**Ultra-Low Emission Zone (ULEZ) and Low Emission Zone (LEZ)**

4.2.4. The ULEZ will operate 24 hours a day, 7 days a week within the same area as the current Congestion Charging Zone (CCZ), and comes into force on April 2019. The introduction of the ULEZ will reduce exhaust emissions of NO<sub>2</sub> and particulate matter PM<sub>10</sub> and PM<sub>2.5</sub>. In 2019, all cars, motorcycles, vans, minibuses, buses, coaches and heavy goods vehicles (HGVs) will need to meet exhaust emission standards, or pay a daily charge. In the case of petrol cars and vans this means Euro 4, and Euro 6 for diesels. HGVs and coaches are also Euro 6.

4.2.5. As part of the Mayor's pledge to help improve air quality and health for all Londoners, he is proposing to make the London-wide Low Emission Zone (LEZ) stronger and expand the Ultra Low Emission Zone (ULEZ) requirements for vehicles, subject to consultation. This involves introducing a Euro 6 emissions standard London-wide for heavy duty vehicles (buses, coaches, Heavy Goods Vehicles (HGVs) and other specialist heavy vehicles) from October 2020 and expanding the ULEZ for light duty vehicles (such as cars, vans and motorcycles) so that all vehicles are subject to emissions standards within an area



Note: In the hatched areas, standards indicated by both colours apply.  
 \*Vehicle class is indicative only, additional vehicles are affected  
 \*\*Minimum emissions standard is for NOx and PM unless otherwise stated

roughly bounded by the North and South Circular Roads from October 2021.

- 4.2.6. 5 of the schools audited were located within the current T-Charge area, which will become the ULEZ from April 2019. A further 35 schools are located in what would become the expanded ULEZ area subject to the outcome of the consultation exercise, in 2021.
- 4.2.7. The remaining 10 schools are located outside of the expanded ULEZ area, but would still benefit from the proposed tightening of the LEZ, as would the central and inner London schools. It is also anticipated that the schools outside the proposed enlarged ULEZ zone would benefit from all the buses and taxis traveling past on route to the zone being required to meet the tougher new standards.
- 4.2.8. The introduction and expansion of the ULEZ, and tightening of the LEZ standards, is forecast to result in NO<sub>x</sub> emission reductions of between 10% and 28%<sup>9</sup> in the boroughs covered by the school air quality audit programme by 2020.
- 4.2.9. Whilst a number of vehicles may divert their journey in order to avoid paying the daily ULEZ charges, TfL anticipate that the impact of this will be offset by vehicle owners replacing their vehicles in order to enter the ULEZ area without charge, or opting for a different mode of travel, and that all areas of London will see a fall in air pollution as a result of the package of a stronger London wide LEZ standard and an expanded ULEZ.

#### **Low Emission Buses**

- 4.2.10. TfL has plans to introduce around 3,000 Ultra Low Emission double-deck buses in central London by 2019 and over 250 Zero Emission single deck buses into central London by 2020. From 2018, all new double-deck buses entering the TfL fleet will be diesel-hybrid meeting Euro VI emissions standards. TfL is planning to re-fit around 5,000 buses so that they meet the highest emissions standards (Euro VI) as quickly as possible.



- 4.2.11. They have also announced plans for 12 low emission bus zones outside central London, where only low emissions will be permitted to run within the Putney Low Emission Bus Zone. The new buses, will be a combination of hybrid and clean buses that meet Euro VI standards, and expected to reduce NO<sub>x</sub> emissions from buses along the routes by around 84 per cent. The Mayor's manifesto commitment is to introduce Low Emission Bus Zones by 2020.

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<sup>9</sup> [https://consultations.tfl.gov.uk/environment/air-quality-consultation-phase-3b/user\\_uploads/appendix-c---impact-of-proposals-by-borough.pdf](https://consultations.tfl.gov.uk/environment/air-quality-consultation-phase-3b/user_uploads/appendix-c---impact-of-proposals-by-borough.pdf)

### Cycle route improvement schemes

4.2.12. A number of Cycle Superhighway schemes and Quietway routes are proposed in the vicinity of the schools audited, which will promote greater travel by sustainable mode, and include wider pedestrian and urban realm improvements throughout their routes, including:

- Cycle Superhighway 4 (CS4) – which would give cyclists a continuous segregated route between Tower Bridge and Greenwich, and improve pedestrian facilities and public spaces
- Cycle Superhighway 11 - will give cyclists a clearer, safer route from Swiss Cottage to the West End
- The East-West Cycle Superhighway has improved facilities in central London for both cyclists and pedestrians
- North-South Cycle Superhighway is a mainly segregated cycle route will run between Elephant and Castle and King's Cross

### Low Emission Neighbourhood (LENs)

4.2.13. A number of the schools audited are located near or within a Low Emission Neighbourhood (LEN). A low emission neighbourhood (LEN) is a scheme aimed at improving air quality and promoting sustainable living, through the application of a holistic package of measures and innovative approaches, concentrated within a localised area, to serve as a demonstrator of a range of different approaches and innovative measures.

4.2.14. As part of Mayor's Air Quality Fund (MAQF) there are currently 5 LENs under development for April 2019, including:

- Barbican (City of London)
- City Fringe (Shoreditch) (Hackney, Islington and Tower Hamlets)
- Greenwich Town Centre (Greenwich)
- Ilford Garden Junction (Newham and Redbridge)
- Marylebone (Westminster)

4.2.15. The schemes featured within these LENs include:

- Car-free days
- Pocket parks
- Green cover including vegetation on roofs
- Behaviour change initiatives
- No idling zones
- Coordinated deliveries
- Electric vehicles

### School STARS Activities

- 4.2.16. STARS (Sustainable Travel: Active, Responsible, Safe), is TfL's accreditation scheme for London schools and nurseries, to inspire young Londoners to travel to school sustainably, actively, responsibly and safely by championing walking, scooting and cycling.
- 4.2.17. As part of the STARS scheme schools receive bespoke guidance from the borough, high quality on-line resources with over 120 activity cars, access to a London-wide community of schools, priority access to funding, accreditation and recognition.
- 4.2.18. 68% of schools in the programme were engaged in STARS, with 30% of schools having achieved gold accreditation status.



### Healthy Schools London Accreditation

- 4.2.19. Healthy Schools London is a programme that supports London's schools to provide an environment and culture that helps their pupils grow to be healthy happy and learn. This programme supports schools as they work towards an award scheme (sponsored by the Mayor of London), with a network of local coordinators, and a range of resources, tools and advice provided through this website and regular workshops for schools.
- 4.2.20. 50% of schools in the programme were engaged with Healthy Schools London, though only 4% had achieved gold accreditation.



**HEALTHY SCHOOLS  
LONDON**

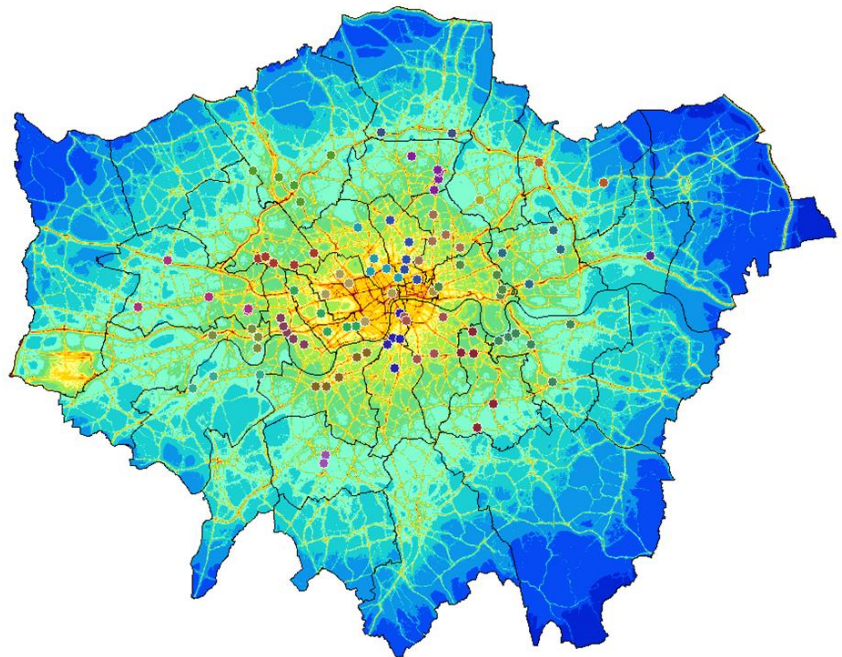
## **Chapter 5 – Audit Programme Findings: Sources of Emissions & Exposure**

## 5 AUDIT PROGRAMME FINDINGS: SOURCES OF EMISSIONS & AIR POLLUTANT CONCENTRATIONS

5.1.1. This chapter describes the air quality assessments undertaken as part of the programme, and summarises at a programme wide level some of the overall findings of the observations for the 50 audits completed.

### 5.2 AIR QUALITY ASSESSMENTS

Figure 8 – Air Quality in London



5.2.1. The air quality data used to assess the pollution climate immediately around each school has used a combination of modelled and measured data.

5.2.2. The study focused on NO<sub>2</sub> concentrations in the vicinity of each school.

5.2.3. Modelled baseline NO<sub>2</sub> annual mean concentrations have been taken from the 2013 London Atmospheric Emissions Inventory (LAEI) model as described in Chapter 2.

5.2.4. The NO<sub>2</sub> concentration for each school provides a measure of the pollution climate in the immediate vicinity (150m) of the school. It encompasses the school itself and the routes frequently used by parents and school pupils on their way to and from school.

5.2.5. In addition to the modelled baseline NO<sub>2</sub> annual mean concentrations, NO<sub>2</sub> measurements were derived for the past ten years (2006-16) for the closest air quality monitoring site to the school. This data was derived from a combination of measurements taken from the London Air Quality Network (LAQN) and Local Authority diffusion tube sites, where available. This data was used to infer the trend in local air quality in the vicinity of the school.

5.2.6. The LAEI model provides mapped baseline annual mean NO<sub>x</sub>, NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> concentrations on a 20m x 20m basis for the whole of London from a base-year of 2013 for 2020, 2025 and 2030. The LAEI uses air pollution emission estimates from a wide range of sources including transport, industrial, domestic and commercial combustion, agriculture and long-range transport using the most up-to-date activity data, emission factors and projection factors.

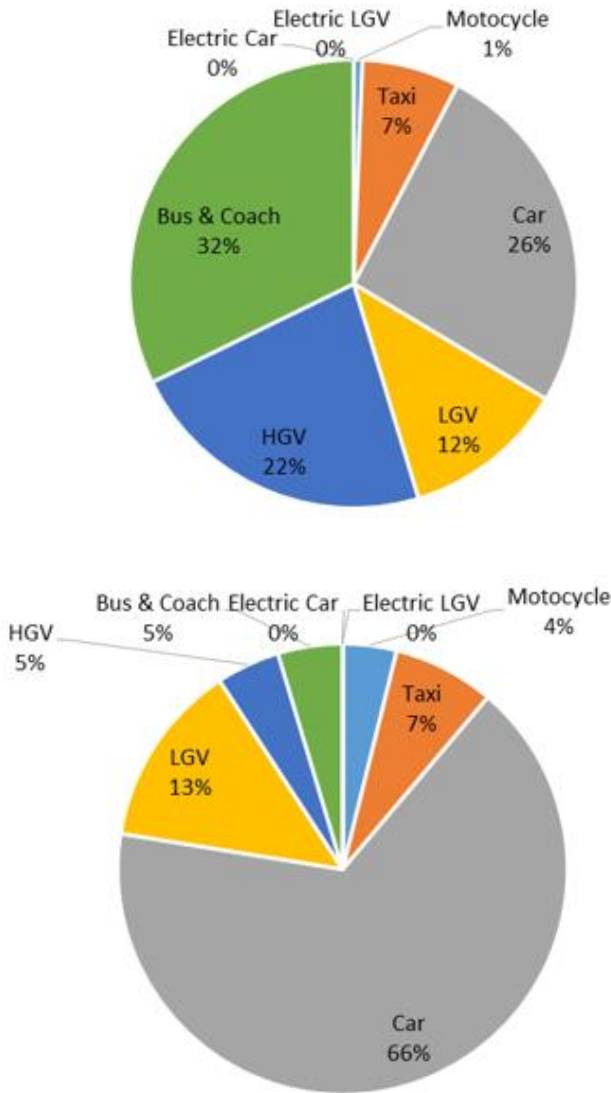
5.2.7. The LAEI does not provide mapped estimates of hourly NO<sub>2</sub> concentrations for comparison with the 1-hour NO<sub>2</sub> air quality strategy objective. Defra's Air Quality Expert Group (APEG) believe that the annual mean NO<sub>2</sub> air quality objective is more stringent than the 1-hour objective in the majority of



situations, and that current evidence suggests that the annual mean NO<sub>2</sub> air quality objective is likely to be breached before the 1-hour objective.

- 5.2.8. As a high-level screening study, the possible exposure at each school, and on the routes frequently used by parents and school pupils on their way to and from school, has been assessed using mapped modelled air pollutant concentrations. As a next step more detailed, location specific assessment of exposure levels at each school, or on the routes frequently used by parents and pupils on their way to school, could be assessed by making measurements at the school façade or by using personal monitors to measure exposure on the approaches to the school.
- 5.2.9. Figure 5 shows the 2013 LAEI baseline annual mean NO<sub>2</sub> concentrations across the capital. The contours (changes in colours) show how the pollution gradient changes, with distance, away from the areas of most concentrated activity in central and inner London, and the more heavily trafficked roads and transport hubs.
- 5.2.10. Nearly 50% of NO<sub>x</sub> emissions in London are from road transport. Vehicle emissions data for the LAEI modelled road links within 200m of the school, split by source, have been analysed to identify the key sources contributing to NO<sub>2</sub> in the vicinity of the school.
- 5.2.11. The pie charts below show that on average across the schools audited as part of the programme, buses and coaches made up only 5% of the total traffic, but contribute 32% of the transport related NO<sub>x</sub> emissions locally. Whilst HGVs also made up only 5% of traffic on average, however they contribute disproportionately towards local emissions, accounting for 22% of emissions.

**Figure 9 – Road Transport NO<sub>x</sub> Emissions and Volumes (School Air Quality Programme Average)**



**Non road-transport based sources of emissions**

- 5.2.12. Whilst the focus of these audits has been road based transport related sources of emissions, it is important to highlight other sources of emissions, which have also been considered as part of the recommendations as part of this study.
- 5.2.13. The remaining half of emissions not emitted by road transport come from a range of sources, including construction, residential and commercial buildings, river, aviation, and industrial emissions.
- 5.2.14. In London heating systems are another major source of Nitrogen Oxide (NO<sub>x</sub>) emissions, including gas powered boilers in domestic and commercial buildings.
- 5.2.15. Demolition and construction work can be a major source of local particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>) pollution. In addition to building work, non-road mobile machinery (NRMM), such as generators, can contribute to elevated NO<sub>x</sub> and particulate matter emissions. In recognition of their contribution to

poor local air quality, the GLA has introduced Supplementary Planning Guidance in recent years to control this source, including a register of plant.

- 5.2.16. Other sources of particulate matter include wood burning stoves, accidental fires and burning of waste. A large proportion of particulate matter originates from natural sources, such as sea salt, forest fires and Saharan dust, which are emitted by sources located outside London and which are less easy to control.
- 5.2.17. In addition there are many sources of particulate matter from outside London, deriving from both human activity and natural sources. This imported particulate matter forms a significant proportion of total particulate matter in London.

### **Limitations and Assumption**

- 5.2.18. The LAEI model data used in these assessments is verified against measurements from the LAQN and provides a high-level summary of air pollutant concentrations across London. At a strategic London-wide level, the model predications can be used to identify areas of poorer air quality. Inevitably there will be some differences between the modelled concentrations and local measurements in places due to technical limitations within the model. Such a high-level modelling approach does not capture unique local features, for example street geometry and local topography, that may influence the dispersion of emissions and hence concentrations of air pollutants at a local level.
- 5.2.19. In order to address this limitation, the long term trends in local NO<sub>2</sub> concentrations for the past ten years (2006-16) were derived from available measurements from the closest local air quality monitoring station or NO<sub>2</sub> diffusion tube site. This approach allowed the measurements and model data to be compared. Local Authority NO<sub>2</sub> diffusion tube measurements were taken from published annual local authority air quality reports.
- 5.2.20. Local authority air quality measurements tend to focus on pollution “hotspots”, providing continuous measurements over many months or years. In order to fill the gaps in these long term datasets, and assess the potential impacts and sources at other locations, short-term or “snapshot” measurements are used. Such measurements provide valuable insights that can fill the gaps in existing datasets, improving our knowledge and understanding, however these types of measurements have not been used in this study. Due to their short duration they may be influenced by transient events, leading to short term changes that are not representative of long term trends.
- 5.2.21. The proximity of the schools in the study to the air quality monitoring stations or NO<sub>2</sub> diffusion tube sites was derived on the basis of the distance between the X (in metres north) and Y (in metres east) co-ordinates for each school, taken from the Department for Education’s Edubase, and the published co-ordinates of each monitoring site. The monitoring site co-ordinates were taken from either the LAQN website or the published air quality reports. The closest air quality monitoring site to each school was determined, however, the range of distances varied from tens to hundreds of metres.

## **5.3 AUDIT FINDINGS: KEY OBSERVATIONS**

- 5.3.1. At a programme level, in reviewing the fifty completed school air quality audits, it is possible to identify some recurring themes and make a number of observations about the issues identified.

5.3.2. As in the summary audit reports the issues are separated into 'highways' related issues, i.e. those recorded in the streets and buildings surrounding the school, and 'School grounds and buildings related' issues.

### Highways

- **Heavily trafficked roads** – in most cases the schools were located on or near busy roads with high volumes of traffic, which were by far the primary source of local emissions affecting the school. Road transport contributes around 50% of NO<sub>x</sub> emissions in London.
- **Large numbers of buses passing the school** – often the roads around the schools were bus routes with frequent services, and whilst this is positive in facilitating good access to public transport, where these buses are not modern low emission vehicles they contribute significantly to local emissions. Buses and coaches contributed on average 32% of road based emissions on the main roads around the schools audited.
- **Lorries and freight activity** - were particularly evident at a number of the sites when located near major areas of construction and redevelopment. HGVs contributed on average 22% of road based emissions on the main roads around the schools audited.
- **Congestion and queuing traffic** - some schools suffered from the effects of congested traffic and queuing back from junctions and other bottlenecks, including bus stops, past the school site, or through key crossing points on the children's route to school, worsening local emissions and exposure.
- **Unsafe stopping and parking** – a recurring issue was unsafe or inconsiderate parking and picking-up/ dropping-off of children by car, including on the School Keep Clear markings, often resulting in children crossing the road amongst parked vehicles with poor visibility, and amongst manoeuvring vehicles, or vehicles obstructing traffic and causing delays worsening local congestion, and sometimes issues with local residents.
- **Engine idling** – was commonly observed outside the schools during peak drop off times, when the greatest numbers of children will be exposed to unnecessary emissions, often in close proximity to the school gates.
- **Hostile environments for pedestrians, cyclists and scooters** – potentially discouraging greater travel to school by more sustainable modes and perpetuating the issues caused by additional car use. In a number of cases there were no crossing facilities on key desire lines, resulting in the children running to cross the road, and narrow footways causing children to step out into the roads.
- **Severance and exposure whilst crossing busy roads** – often children approaching from particular directions have to cross a busy road on route to school, and wait for extended periods at the roadside where exposure to emissions is at its worse, before they are able to cross. In some cases their routes are elongated by a lack of crossing points, further extending the period of exposure and potentially serving to discourage greater travel by sustainable modes.
- **Rat running traffic past schools** – in a number of cases minor roads passing schools were used by through traffic diverting from the primary network to avoid congestion elsewhere, worsening local emissions, and sometimes coming into conflict with slower moving school traffic and children approaching the school.
- **Conflict with cyclists** – in some instances where cycle super highways or other higher speed cycle routes passed a school, concerns were raised around the safety issues and conflicts with children, particularly where formal crossings or signage was not in place to slow approaching cyclists.

- **Construction activity and new developments near the school** – are source of emissions, including from the non-mobile machinery, such as generators, as well the dust released into the air through the construction activities.
- **Major trip attractors and sources of emissions nearby** - some of the schools are located close to large premises such as hospitals, railway stations, colleges, major office complexes or shopping centres, which generate a significant number of vehicle movements, including taxis, private hire vehicles, cars and delivery and servicing vehicles. The buildings themselves also contribute to local emissions, particularly in the case of licensed Part A and Part B processes<sup>10</sup>.
- **Rail/ tube lines** – a number of the schools are located in close proximity to mainline railways, with diesel powered trains which contribute to the non-road based portion of transport emissions.

### School grounds and buildings

- **Playgrounds and outdoor spaces exposed to emissions** - with limited screening from passing traffic, and where children spend extended periods during break times, PE and in free flow classes, particularly in the case of the younger children. The limited screening sometimes also posed issues in terms of privacy and security concerns.
- **Children waiting to enter the school grounds on busy roads** – in some instances children are required to wait in areas exposed to higher levels of emissions when arriving prior to the school gates opening.
- **Lack of suitable storage space for scooters and bikes** – which may serve to dissuade greater active travel.
- **School buildings reliant on natural ventilation** – most of the school buildings audited dated back to the late nineteenth or early twentieth century, and are reliant on opening doors and windows in order to cool or ventilate the classrooms, worsening exposure to emissions, particularly where classrooms are in close proximity to a busy road or other sources of emissions.
- **Poor insulation and inefficient heating** – due to the age of many of the school buildings they often exhibited poor insulation, including large single glazed windows, often due to expense or limitations of replacing the historic windows. Poor insulation will result in greater heat loss during the winter months, and so potentially increased run times by school boilers, and therefore greater emissions. Whilst during the summer it will result in greater heat gain, making it more likely the windows and doors would need to be opened if reliant on natural ventilation, so worsening exposure to local emissions. A number of schools reported issues with heating the rooms of the school effectively, with some becoming overheated and so opening windows, whilst others were still cold and reliant on free-standing electric heaters to supplement the central heating system.
- **Aging boilers** – in some cases the schools boilers were aging and would not meet modern efficiency standards, resulting in higher levels of emissions locally from the boiler flues. There were also a number of cases where the flues were positioned such that the emissions were directed near the playgrounds or outdoor spaces used by children.

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<sup>10</sup> Part A and B Processes include regulated industrial installations that have the potential to cause pollution and are required to have an Environmental Permit to operate, including facilities which carry out industrial processes, waste activities, mobile plant and solvent emission activities

## **Chapter 6 – Toolkit of Measures**

## 6 TOOLKIT OF MEASURES

### 6.1 DEVELOPING THE TOOLKIT

- 6.1.1. A toolkit of measures for addressing air quality issues was developed for use in informing the recommendations for each school.
- 6.1.2. The toolkit was compiled from a review of best practice approaches and new technologies, including both well established and simple measures, and more innovative or harder hitting solutions, and both physical and behavioural measures.
- 6.1.3. The toolkit is multi-disciplinary and holistic in its approach, as promoted by the Healthy Streets approach, in seeking to address a broad range of factors which each influence how streets are used, how people travel and consequently how clean the air is in and around the school.
- 6.1.4. The toolkit will provide further information, including:

- Comprehensive set of measures
- Description
- Benefits
- Precedents
- Photos

- 6.1.5. The toolkit of measures and audit templates will serve as a replicable good practice approach, but are also intended to be live documents, to build on our knowledge of how effective different measures prove to be over time, allowing the toolkit to be continually refined for future audits. As such, the reports also include guidance for monitoring pre and post implementation.

#### Key assessment criteria

- 6.1.6. The measures and initiatives have been categorised as either highways, school grounds, school building, behaviour change or wider measures, and assigned an indicative rating against a series of key criteria, including:
- Potential Air Quality Improvement
    - Low – nominal measureable change but a tangible reduction in sources or exposure
    - Medium – a small measurable change in air quality
    - High – a large measureable improvement in air quality
  - Wider Benefits
    - Such as improved safety, visual amenity, child health and welfare, improve learning environments, costs savings, promotion of sustainable transport, contributes to STARS or Healthy Schools London.
  - Cost (*Note these reflect the overall costs, but these may vary amongst difference stakeholders*).
    - Low - <£10k
    - Medium - £10k-100k
    - High - >100k
  - Deliverability
    - Quick Win – readily deliverable within 12 months

- Medium term – deliverable within 1-3 years
- Longer term – only deliverable in the longer term (i.e. over 3 years)

■ Stakeholder Support

- Low – likely to be significant objections which could delay/prevent the scheme
- Medium – may be some objections and will require consultation but not significant delays
- High – likely to be strong support from key stakeholders

6.1.7. These are high level comparative analyses intended to offer a means of considering the recommendations against one another in relative terms. The potential air quality improvement, wider benefits, cost, deliverability and likely stakeholder support for many of the measures identified would often vary from site to site, depending on the size and complexity of the measures, as well as other local factors.

6.1.8. Further more detailed research and options development would be required to quantify these recommendations in greater detail, such as would be undertaken in a subsequent feasibility study. The implementation of the measures will be dependent on securing funding to enable delivery over time (see section 7.2), as well as undertaking feasibility assessments and scheme prioritisation.

## 6.2 APPLYING THE TOOLKIT

6.2.1. Based on the preceding desktop research, site audits and stakeholder feedback, a range of recommended measures and initiatives have been identified to deliver air quality improvements and reduced exposure to air pollution.

6.2.2. These recommendations are drawn from a comprehensive School Air Quality Audit Toolkit of Measures, (see Appendix D for a full length version of the toolkit, or the summary in the following pages).

6.2.3. The characteristics of the local area, school site and school building must be carefully considered when identifying and tailoring a suitable package of measures to address the issues identified in causing sources of pollution, or exposure to air pollution. These recommendations should also be developed with an appreciation of any relevant existing plans for the local and wider area around the school.

6.2.4. The toolkit is used as follows as a part of the overall air quality audit process.

- a.) Air quality assessments and context plan preparation
- b.) Fieldwork – complete audit templates with input from the school and borough officers (air quality, school travel, transport planning). Using the **toolkit** as a reference during the brainstorming session.
- c.) Review findings and identify key issues, sources of emissions and causes of exposure
- d.) Identify measures from the **toolkit** to address these issues, informed by the audit findings
- e.) Identify funding sources and task owners
- f.) Establish an approach to monitoring the effectiveness of measures



## 6.3 SUMMARY OF THE TOOLKIT

**Table 4 – Overview of toolkit and types of measures**

<b>1. HIGHWAY MEASURES</b> ( <i>Key Stakeholder: Borough/ TfL</i> )	
A	Anti-idling
B	Reducing traffic flow
C	Smoothing traffic flow/speed
D	Reducing drop-off activity
E	Improved pedestrian and cyclist environments
F	Promote a switch to low emission vehicles
G	Parking/loading
H	Buses
I	Freight and Deliveries
J	Construction
K	Planning Policy and Strategy
L	Green Infrastructure
M	Screening and barriers
<b>2. SCHOOL SITE MEASURES</b> ( <i>Key Stakeholder: School/ Borough</i> )	
<b>N</b>	<b>School Grounds</b>
<b>School Building</b>	
O	School boilers/ heating
P	Improve product choice (e.g. cleaning products)
Q	Regular service & maintenance of appliances and equipment
R	Improve school building insulation
S	Ventilation / Air Filtration
T	Other
<b>3. BEHAVIOURAL MEASURES</b> ( <i>Key Stakeholder: School/ Borough</i> )	
<b>4. WIDER MEASURES</b> ( <i>Key Stakeholder: Borough/ TfL/ GLA/ Central Government</i> )	

Figure 10 – Summary of toolkit measures

<b>1. HIGHWAY MEASURES</b>		<b>G Parking/loading</b>		<b>2. SCHOOL SITE MEASURES</b>		<b>3. BEHAVIOURAL MEASURES</b>	
<b>A Anti-idling</b>		<b>G1</b> Identify a Park & Stride site		<b>M School Grounds</b>		T1 Attain improved STARS accreditation status, ultimately Gold status.	
A1	Fines	<b>G2</b> Remove or relocate parking/ loading bays and/or amend restrictions		M1	Additional scooter/ cycle parking	T2 Promote cleaner walking routes to school	
A2	Campaigns, including driver engagement	<b>G3</b> Introduce kerb blip loading restrictions		M2	Staff car parking	T3 Promoting Park & Stride	
A3	Information signage	<b>G4</b> Enforce parking restrictions		M3	Anti-idling for deliveries	T4 Promoting car sharing	
<b>B Reducing traffic flow</b>		<b>G5</b> Additional parking charges for more polluting vehicles		M4	Re-timing for deliveries	T5 Walking Route Maps / Leaflets	
B1	'School Streets'	<b>G6</b> Introduce or amend CPZ restrictions around school to restrict non-residents parking		M5	Reduce number of deliveries, staff/visitor vehicle trips and/or use more sustainable modes	T6 Parent and Public Workshops	
B2	Collapsible bollards	<b>G7</b> Parking rationalisations with ULEV car clubs		M6	Relocate pedestrian entrances	T7 Prepare 'Welcome Packs' for new pupils / parents	
B3	'Play Streets' ( <i>temporary measure</i> )	<b>H Buses</b>		M7	Green screens	T8 Deliver Air Quality focused lesson/s to children	
B4	Road closure	<b>H1</b> Bus stop relocation		M8	Trees/ shrubs/ planters	T9 Awareness raising session amongst staff	
B5	Filtered permeability	<b>H2</b> Low emission buses		M9	Green spaces	T10 Daily monitoring of London Air website/ app	
B6	One-way streets/ No entry restrictions	<b>I Freight and Deliveries</b>		M10	Pupil & staff cycle parking	T11 Add Air Quality to Junior Citizenship Scheme	
B7	ULEV-only streets	<b>I1</b> Engage with local businesses to reduce freight/ delivery emissions		M11	Reduced waiting times to enter school grounds	T12 Anti-idling campaign	
B8	Width restriction (e.g. 7ft)	<b>I2</b> Promote low emission vehicles for freight and deliveries		M12	Relocate playgrounds and free flow spaces	T13 Attain an improved Award in Healthy Schools London, ultimately a Gold Award	
B9	Environmental weight limit signs	<b>I3</b> Delivery Servicing Plans (DSPs) for new developments		M13	Co-ordinate start/ finish times with nearby schools	T14 Awareness raising events amongst the wider community	
B10	Reallocate road space	<b>I4</b> Re-time Borough commercial waste collection		M14	Reconsider playground layouts to reduce exposure	T15 Cycle training and promotional initiatives	
B11	Weight restrictions	<b>J Construction</b>		M15	Sheltered waiting areas for parents/ guardians	T16 Gamification to promote active travel	
<b>C Smoothing traffic flow/speed</b>		<b>J1</b> Planning conditions to reduce impacts of freight traffic		<b>School Building</b>			
C1	Modify traffic calming	<b>J2</b> Managing the impact of dust and emissions during construction and demolition		<b>N School boilers/ heating</b>			
C2	Optimise traffic signals	<b>J3</b> Retrospective discussions with already permitted developments to lessen the impacts		N1	Upgrade aging boilers	U1 Targeted scrappage scheme for polluting vehicles entering London	
C3	Junction improvements	<b>J4</b> Non-Road Mobile Machinery Audit		N2	Install Optimising Compensator Control System for School Boilers	U2 Reform Vehicle Excise Duty	
<b>D Reducing drop-off activity</b>		<b>K Planning Policy and Strategy</b>		N3	Boiler flues and extraction equipment	U3 Promote a transition to electric heating and heat pumps	
D1	Public Space Protection Orders	<b>K1</b> Healthy Streets approach, sustainable transport and road space reallocation from vehicular traffic		N4	Reducing over-heating and tackling heat gain	U4 Reform Buildings Regulations to promote heat pumps	
D2	School Keep Clear markings	<b>L Green Infrastructure</b>		N5	Replace aging radiators	U5 Zero emission zones	
D3	Double/single yellow lines	<b>L1</b> Green screens		<b>O Improve product choice (e.g. cleaning products)</b>			
D4	Improve enforcement of restrictions	<b>L2</b> Trees, shrubs, planters		<b>O1</b> Improve product choice (e.g. cleaning products)			
<b>E Improved pedestrian and cyclist environment</b>		<b>L3</b> Green Gateways		<b>P Regular service &amp; maintenance of appliances and equipment</b>			
E1	Improved pedestrian environment - footway widening, kerb build-outs	<b>L4</b> Pocket parks		<b>P1</b> Regular service & maintenance of appliances and equipment			
E2	Improved crossing facilities on desire lines			<b>Q Improve school building insulation</b>			
E3	Traffic calming			<b>Q1</b> Improve school building insulation			
E4	Improve Visibility of the School			<b>Q2</b> Upgrade windows			
E5	Cycle hangers			<b>Q3</b> Replace temporary classrooms with permanent structures			
<b>F Promote a switch to low emission vehicles</b>				<b>Q4</b> Green Roofs			
F1	Ultra-low Emission Zone (ULEZ) & Low Emission Zone (LEZ)			<b>S Ventilation / Air Filtration</b>			
F2	Comprehensive charging provision for ULEVs			<b>S1</b> Installation of Air Conditioning Units			
				<b>S2</b> Introduce Air Filtration Systems			
				<b>S3</b> Install HEPA Filters in Air Handling Units			
				<b>S4</b> Other air filtration systems - air purifiers			
				<b>S Other</b>			
				<b>S1</b> Air quality monitoring and information provision eco-monitors and walking route maps.			

- 6.3.1. Of the over one-hundred measures included within the toolkit for improving air quality at schools, 78% are projected to have relatively small impacts on air quality in isolation, whilst 14% are projected to have a moderate impact, and only 8% were considered likely to deliver a large measurable improvement in air quality in isolation. Consequently when developing recommendations, it is essential to assemble a package of measures, which in combination can contribute towards improving air quality, and including with those some moderate and higher impact measures.

## 6.4 HARD HITTING MEASURES

- 6.4.1. The hard hitting measures featured within the toolkit include:

- Road closures, filtered permeability and school streets
- Ultra-low Emission Zone (ULEZ)
- Low emission buses and bus stop relocations
- Healthy Streets approach, sustainable transport and roadspace reallocation from vehicular traffic
- Wider measures – including a Targeted scrappage scheme for polluting vehicles entering London, Reforming Vehicle Excise Duty, Promoting a transition to electric heating and heat pumps, and introducing a zero emission zones in central London and town centres and larger inner London and London-wide zones in the longer term

- 6.4.2. The majority of hard hitting schemes require the borough, TfL or Central Government to play a leading role in their delivery. In addition to which many may need legislation and/or funding to be implemented and are not short-medium term measures, hence the importance of a package of smaller measures.

## 6.5 MAINTAINING THE TOOLKIT

- 6.5.1. The intention is for this toolkit to be continually updated and refined as new findings and data become available, and our understanding of how effective different measures prove to be over time.
- 6.5.2. It is also recognised that whilst the toolkit includes an extensive range of measures, potential new solutions and approaches continue to emerge apace. In many cases the efficacy of possible new measures, and particularly the more innovative measures, requires further testing and greater evidence to be considered proven, but may prove to be valuable additions to toolkit in the future.

## 6.6 RELATED PROGRAMMES AND SCHEMES

- 6.6.1. The toolkit also links into a number of well-established programmes and complementary schemes, including:

- STARS accreditation scheme for schools
- Health Schools London
- Air quality alerts
- Mayor's London Curriculum Programme
- Healthy Early Years London

- 6.6.2. Further details are provided for each of these below:

### STARS accreditation scheme for schools

- 6.6.3. STARS is TfL's world leading school travel accreditation scheme, inspiring young Londoners to travel smarter and more sustainably, and should form the



framework within which the behaviour change related components of the school air quality audit recommendations are recorded for each school.

- 6.6.4. Many of the recommendations would also serve to contribute towards the required 'travel activities' and 'support activities' required to attain Gold status – which should ultimately be the aim for each school.
- 6.6.5. Equally by embracing the STARS process, delivering sustainable travel activities, achieving modal shift targets and demonstrating effective community engagement, the schools will have successfully delivered air quality improvements through reduced travel by cars. The framework of STARS enables schools and boroughs to document, track and share their continued progress, and embed and implement the recommendations throughout each schools' wider community.
- 6.6.6. Schools are encouraged to note any air quality related activity undertaken on their TfL STARS profile [stars.tfl.gov.uk](http://stars.tfl.gov.uk), and to help inspire other schools, they are required to tell their story for each activity they have delivered.
- 6.6.7. The table below outlines the requirements for achieving the Bronze, Silver and Gold accreditation.

**Table 5 – STARS Scheme Accreditation Requirements**

Bronze	Silver	Gold
<ul style="list-style-type: none"> <li>– Complete 10 different 'travel activities' from the list of 80. Evidence is not required but it is recommended.</li> <li>– Complete 6 different 'supporting activities' from the list of 40. Evidence is not required but it is recommended.</li> <li>– Complete a hands up survey (with a respondent rate of at least 90%) to get a baseline understanding of how pupils get to school</li> <li>– Set targets for a minimum of two modes</li> </ul>	<ul style="list-style-type: none"> <li>– Complete 20 different 'travel activities' from the list of 80. Evidence is required and must be submitted to the STARS website.</li> <li>– Complete 10 different 'supporting activities' from the list of 40. Evidence is required and must be submitted to the STARS website.</li> <li>– Demonstrate that a shift away from the car has been achieved through hands up survey results</li> <li>– Record its staff travel patterns, through the same hands up survey method</li> <li>– Set up a School Travel Plan working group with student representatives</li> <li>– Present various bits of evidence of pupil, governor, staff and school council involvement (such as meeting minutes)</li> <li>– Conduct consultation with parents and show results of this</li> <li>– Carry out research and/or consultation</li> </ul>	<ul style="list-style-type: none"> <li>– Complete 25 different 'travel activities' from the list of 80. Evidence is required and must be submitted to the STARS website.</li> <li>– Complete 15 different 'supporting activities' from the list of 40. Evidence is required and must be submitted to the STARS website.</li> <li>– Demonstrate that mode share has been shifted away from the car by at least 6%, or that 90% of travel is done by non-car modes</li> <li>– Demonstrate that the targets from the last academic year were achieved or exceeded</li> <li>– Demonstrate that residents and neighbours are aware of the school's plans to promote safer and more active travel</li> <li>– Demonstrate that the travel plan is an agenda item on at least one senior management meeting per year</li> <li>– Demonstrate that safe and active travel is part of the School Development Plan</li> </ul>

- 6.6.8. A number of the toolkit measures would also count towards attaining / maintaining a schools Gold STARS scheme accreditation, including: 'anti-idling awareness raising measures', 'school play

streets' and 'park and stride'. STARS activity cards are available for these measures, as well as wide range of other topics <https://stars.tfl.gov.uk/Explore/Idea>.

### Healthy Schools London

6.6.9. The Healthy Schools London programme should also as framework for promoting sustainable transport measure that will contribute towards improved local air quality. To achieve the Healthy Schools London Bronze award, one of the criteria is that “*the school promotes active travel to and from school*”, and provides a number of examples, including:

- By implementing a school travel plan and running active travel initiatives such as:
- walk/cycle to school days
- walkers/cyclers breakfast clubs
- cycling at break times
- pedestrian skills and cycle training
- active travel competitions
- accreditation programmes

6.6.10. The schools must complete the following statements:

- Active Travel is promoted by:
- School travel plan: Date awarded/reviewed
- Active travel initiatives including:

6.6.11. A number of the toolkit measures for the schools are initiatives that would also count towards these criteria, including a variety of proposals to promote improved environments for walking, scooting and cycling, and initiatives to promote behaviour change and raise awareness of benefits of active travel.

### Air quality alerts

6.6.12. When high and very high air pollution is forecast, air quality alerts are displayed at many public locations across London including 2,500 bus stop countdown signs and all Tube stations. Alerts and guidance are also available via social media, an app and a text alert service providing information and guidance on the alert level.

6.6.13. The Mayor has recently (January 2018) expanded his existing air quality alerts systems and appointed King's College London to continuously monitor air pollution using the existing air quality monitoring network and cutting-edge modelling tools, delivering alerts as required. They will also directly notify a wider group of stakeholders so that the alerts are disseminated more widely and targeted at Londoners who are most vulnerable to the impacts of poor air, including schools.

6.6.14. Each school has been provided with further information via email on what the alert means, and how to reduce pupils' personal exposure, and they can contact [AirQualityLondon@london.gov.uk](mailto:AirQualityLondon@london.gov.uk) for more information.

### Mayor's London Curriculum Programme

6.6.15. Engagement activities to raise awareness of the issue of air quality amongst children and the school community are fundamental to achieving change.

6.6.16. The London Curriculum offers a wide range of high-quality teaching resources supporting most subjects on the national curriculum, CPD for teachers and events for children. Resources and activities are inspired by the city's diverse culture, heritage, science and technology, built environment, green spaces and rivers.



6.6.17. The Mayor of London's Air Quality Audits will be supported by a new programme of targeted activity delivered through the London Curriculum. The focus of the programme is to support teacher subject knowledge, and confidence to tackle air quality as a science subject recognising that this requires a wide knowledge and skill base of science, statistics and mapping. Activities associated with the above is detailed in Appendix C, for delivery by the schools / London Curriculum, and summarised below:

- WSP undertake school AQ audits
- GLA provide schools with results and recommendations from WSP's audits, including outputs to be used for lesson material to use in future projects / initiatives.
- Invite the schools to register to use the London Curriculum and sign-up for offers and events
- Royal Geographical Society host a primary school geography network meeting – date tbc
- Invite the schools to take part in the Mayor's London Scientist award  
<https://www.london.gov.uk/what-we-do/education-and-youth/mayors-london-scientist>
- Invite the schools to attend the Big Bang sub-regional events and undertake a project focused on air quality with pupils which can be entered into the competition with prizes supported by GLA  
<https://www.stem.org.uk/enrichment/stem-directory/activity/big-bang-london>

### Healthy Early Years London (HEYL)

6.6.18. Building on the success of Healthy Schools London, Healthy Early Years London is an awards scheme funded by the Mayor of London that supports and recognises early years setting achievements in child health, wellbeing and school readiness. Healthy Early Years London focuses on the whole child and gives settings a framework for their activity with children, parents, carers and staff and the wider community. HEYL will help to reduce health inequalities by creating environments which support a healthy start to life and promote a whole setting and targeted approach across a number of themes including Sustainability-active travel and air quality.

6.6.19. HEYL complements and enhances the statutory Early Years Foundation Stage (EYFS) framework, providing further focus on children, families and staff health and wellbeing. There are 4 levels of

Awards: HEYL First Steps, Bronze, Silver and Gold. HEYL can be used as an improvement tool to support practice in all Early Years settings including active travel:

- Active travel is supported and encouraged, both for journeys to and from the setting and for trips (e.g. walking, scooting)
- The setting is signed up to receive air quality alerts from [www.airtext.info/alerts](http://www.airtext.info/alerts)
- There are activities and information available for parents and carers to support sustainability including: active travel, recycling or energy saving
- Practitioners are able to discuss and advise parents and carers on active travel

6.6.20. The full programme is due for official launch in spring 2018 which is intended to reach all 13,000+ settings and providers of childcare across London.

## **Chapter 7 – Audit Programme Recommendations**



## 7 AUDIT PROGRAMME RECOMMENDATIONS

- 7.1.1. Based on the preceding desktop research, site audits and stakeholder feedback, a range of recommended measures and initiatives were identified to deliver air quality improvements and reduced exposure at each of the schools. The recommendations will not in themselves solve the air quality problem, but will each contribute directly or indirectly to helping improve the situation in and around the schools.
- 7.1.2. The recommendations developed for each of the fifty schools audited were informed by a collection of local factors and conditions, unique to each particular school. However whilst each school building, school site and its local setting are different, it is possible to discern some common themes and make a number of observations:
- **A holistic approach is needed** – a recurring theme to emerge through the audit programme is that it will be essential for stakeholders to take forwards a package of complementary measures, in order to deliver a combination of quick win improvements for the school, but also thinking more holistically about how some of the medium to longer term recommendations can be progressed, to deliver more transformational change.
  - **Hard hitting measures** – are important in bringing about significant reductions in emissions and exposure, and as detailed in Chapter 1, the Mayor is implementing a major programme featuring of hard hitting measures. However they are also more challenging to deliver, with longer lead in times, higher costs and greater complexity. Of the over one-hundred measures included within the toolkit of measures for improving air quality at schools, 78% are projected to have relatively small impacts on air quality in isolation, whilst 14% are projected to have a moderate impact, and only 8% were considered likely to deliver a large measurable improvement in air quality in isolation.
  - **A package of quick win measures** - when developing recommendations it is essential to assemble a package of lower impact but quick win measures, which in combination can contribute to making a more immediate improvement in air quality, whilst also including with those some moderate and higher impact measures.
  - **Schools and boroughs are engaged** - in most instances schools and boroughs are already proactively engaged in addressing the issue of air quality to some degree. We met passionate individuals keen to make a difference, who were often well informed of the issues, and enthusiastic about delivering a range of solutions to improve local air quality for the children, and the wider community as a whole.
  - **Funding and lack of resources a key concern** – a key concern was the availability of funding and challenges associated with resources and staff turnover.
  - **Joint working and breaking down barriers**—some challenges were encountered in terms of silo working and a lack of sufficiently close collaboration across borough departments, which is essential in tackling the problem of air quality, which as a multi-faceted issue requires considered input from officers representing air quality, transport planning, school travel and planning policy, as well as senior management from the school, the school travel plan co-ordinator or travel/ air quality champion, the school facilities team, and representatives from TfL and the GLA.
  - **Key roles for the borough and TfL**— the majority of hard hitting schemes require the borough or TfL to play a key role in their delivery. In order to take forwards the recommendations

identified within this report, the borough council will also need to continue to work closely with the school and local community, building on the relationships already in place.

- **Schools have limited influence on sources of emissions, but an important role in reducing exposure, raising awareness and anti-idling campaigning** – as the majority of pollution affecting air quality around the school originates from strategic roads and passing traffic, heating buildings across the wider neighbourhood, and background emissions, the scope for the school to lessen emission sources are limited. The schools are however able to play a significant part in lessening exposure of the children, particularly whilst within the school grounds and building. They also have a key role to play in raising awareness, and proactively seeking out and securing funding where available.
- **Double edged nature of some measures** – it is often the case that possible measures may be beneficial in some respects, yet detrimental in others. For example, reducing the waiting time or number of crossing stages for pedestrians may lessen their exposure to emissions, yet serve to worsen congestion and queuing at the signals, resulting in worsening emissions. This may however in turn then result in some traffic taking alternative routes. Consequently there are a lot of factors to consider, many of which would require further assessment and traffic modelling to understand their wider implications in greater detail.

### Highways

- **Buses and lorries often contributed disproportionality to emissions** – consequently measures to address these sources featured prominently in many of the reports, including recommendations for cleaning up of the bus fleet, and targeted improvements of bus routes operating in close proximity of the school. Building on the current programme of low emission bus zones, fleet upgrades and restrictions as part of the ULEZ. By 2020 all buses in London will meet the Euro 6 standard. In addition, from 2018 no new diesel double deck buses have been procured and from 2020 only zero emission single deck buses will be procured. As cleaner buses are introduced or retrofitted these will be prioritised on some of the most polluted corridors through the Low Emission Bus Zone programme. These improvements will have significant benefits for schools. Freight related measures included engaging with local businesses to reduce freight/ delivery emissions, promoting the use of low emission vehicles and cycle cargo freight, Delivery and Servicing Plans (DSPs) for new developments, the introduction of weight restrictions and re-routing, re-timing and consolidation schemes.
- **School travel is often already by sustainable modes, though more can be done** – school travel often does not contribute substantially to local emissions, as many walk, scoot, cycle or travel by public transport, with much of the road transport emissions emanating from busy main roads. However seeking to manage and reduce school related car travel still has an important role to play. Cars picking up and dropping off children near the school gates results in a concentration of emissions amongst larger numbers of children, worsening exposure. The recommendations also often focus on delivering broader improvements to the environment around the schools for walking and cycling, and the promotion of sustainable transport including, footway widening, kerb build-outs, parklets, improved crossing facilities on desire lines, traffic calming.
- **Restricting or reducing traffic** - the scope to fully restrict or reduce traffic levels around many of the schools was often relatively limited, there were however a number of sites where measures such as school streets could be applied effectively, to reduce traffic activity on more minor roads adjacent to the school around arrival and departure times. In some cases

recommendations included road closures and the introduction of filtered permeability. These measures were principally to promote improved pedestrian and cyclist environment, and removing localised exposure. As being minor roads they were not the primary source of local emissions.

- **Parking and loading restrictions** – are a further key mechanism for affecting the sources and exposure to emissions from motor vehicles, with recommendations including removing or relocating parking/ loading bays, amending restrictions, tougher enforcement of existing restrictions, identifying park and stride sites for parents and additional parking charges for more polluting vehicles.
- **Promoting a switch to low emission vehicles** – by providing access to a range of electric vehicle charging points to facilitate the uptake of ULEVs amongst existing car owners.
- **Construction activity** – and mitigating its impacts on the schools was common theme amongst the recommendations, including the introduction of planning conditions to reduce impacts of freight traffic, engaging with developers to review routings to sites, times of day, opportunities for consolidation, support in promoting lower emission fleet usage, managing the impact of dust and emissions during construction and demolition and Non-Road Mobile Machinery audits.

### School Grounds

- **Focus is largely on reducing exposure** - as the emissions sources are mainly off-site.
- **Playgrounds are often exposed** - fronting onto busy roads with few barriers. A common finding from the audits was that there was often considered to be limited scope to change the use or location of the playground or free-flow spaces, owing to operational issues, a lack of space, or areas having been purpose built for a particular age group or purpose. A common recommendation was the introduction of green infrastructure, in the form of green screening/climbers and/or trees and planting. A dense vegetation layer with a high leaf density can catch some pollutants and particulates and hang on to them until they can be washed away by rainfall.
- **Reducing waiting time in more exposed areas** - In some cases children have to wait by the road before the school gates open, and in a number of instances recommendations promote enabling access into more sheltered parts of the school grounds, though this has funding implications to cover the additional staff costs in supervising the site. There were also some opportunities to discourage or prevent use of more polluted parts of the playground or free-flow spaces, and freeing up less polluted areas, by re-locating storage units and fixtures such scooter/ cycle parking.
- **Managing the impact of deliveries** – including seeking to re-time deliveries to not coincide with arrival or pick up times, tackling engine idling, exploring opportunities through a borough procurement framework for school related deliveries to be undertaken via cycle freight and of low emission vehicles, and collaborating with other neighbouring schools.
- **Promoting sustainable travel** - with additional scooter/ cycle parking, for children, parents, visitors and staff.

### School Building

- **Schools were often housed in beautiful historic buildings, but consequently poorly insulated and reliant on natural ventilation** – as such recommendations included a combination of measures to address insulation and ventilation, including upgrading windows to be double glazed or adding secondary glazing, to reduce heat loss, lessen energy usage, and

potentially boiler run-times. Potentially less heat gain in hot weather, along with the introduction of air-conditioning in more exposed locations.

- **Upgrade aging boilers** – whilst most of the air pollution affecting the schools is sourced externally, the emissions from the schools boilers are something the school can affect. In most instances these were found to be in good or reasonable condition, and to be well maintained, with flues positioned effectively to disperse emissions away from the children. However a number of audits recommended replacing older and less efficient boilers with an Ultra Low NO<sub>x</sub> gas boiler with dry NO<sub>x</sub> emissions not exceeding 40 mg/kWh (at 0% O<sub>2</sub>), and where possible replacing these with Heat Pumps with zero local emissions, particularly where more significant building changes were planned.
- **Role for air filtration** – air filtration systems were recommended for classrooms most exposed to poor air quality. These systems are relatively high cost, only cover a single room per unit, and do require ongoing maintenance and power consumption, but have demonstrated some encouraging initial scientific evidence of efficacy, with titanium dioxide proven to act as a reducer for NO<sub>x</sub> and NO<sub>2</sub>, and some claims it will eliminate 99.5% of NO<sub>2</sub>. They can also assist with virus elimination/ reduction. However it should be noted that their effectiveness will be reduced when windows and doors are open, and these systems will not impact on CO<sub>2</sub> levels, which are critical for learning – as high CO<sub>2</sub> means reduced learning and attention, so some fresh air is going to be needed.
- **Reducing over-heating and tackling heat gain** – the audits found that owing to the age of the buildings and their insulation and heating systems, many struggle to achieve consistent conditions throughout the building. For issues such as heat gain as a consequence of classrooms with lots of south facing glass (i.e. solar gain), recommendations included measures like internal blinds or film on the glass. To lessen incidences of winter overheating that result in windows and door being opened, and worsening exposure to pollution from the nearby roads, thermostatic radiator valves (TRVs) were recommended to enable more efficient heating of school.

### **Behaviour change**

- **Key role in raising awareness and reducing travel by car and engine idling** – the schools are well placed to raise awareness of air quality issues amongst children, parents and the local community, with recommendations often including anti-idling campaigns to reinforce signage, including banners incorporating designs by the children, combined with greater enforcement. They can also promote car sharing amongst the school community.
- **Reducing exposure on route to school** - promoting cleaner walking routes to school that minimise exposure to the most polluted areas where possible, utilising apps such as [www.walkit.com](http://www.walkit.com). Promoting Park & Stride to remove some of the causes of exposure by relocating drop off areas safely away from schools.
- **Awareness raising events amongst the wider community** - Raise awareness on the issue of air quality amongst the wider community at a borough or neighbourhood level through events. Parent and public workshops to educate the community on the problems associated with air pollution and the type of measures that can have a positive impact on reducing poor air quality. Preparing 'welcome packs' for new pupils / parents that promote walking to / from school and b) promote the suitable walking routes to avoid air pollution hotspots.
- **Restricting personal deliveries** – whilst the contribution of school staff to local emissions is limited, measures such as restricting personal deliveries to the school, as part of wider initiatives

to discourage personal deliveries to workplaces was recommended, as these account for a significant proportion of total freight traffic in London and their associated emissions. Measures included promoting the use of 'Click & Collect' or 'Pick-up, drop-off' (PUDO) centres.

- **Attaining Gold accreditation status in STARS and Healthy Schools London** – both programmes entail delivering a range of measures promoting active travel, health and well-being and reduced emissions, so provide a good source of measures in their own right. The STARS framework also helps document and track progress, and implement recommendations.
- **CPD supporting teachers subject knowledge on air quality** - CPD for teachers with a focus on supporting teacher subject knowledge and confidence to tackle air quality as a science subject recognising that this requires a wide knowledge and skill base of science, statistics and mapping. Awareness raising sessions amongst staff about the impacts / costs of heating classrooms and sharing best practice.

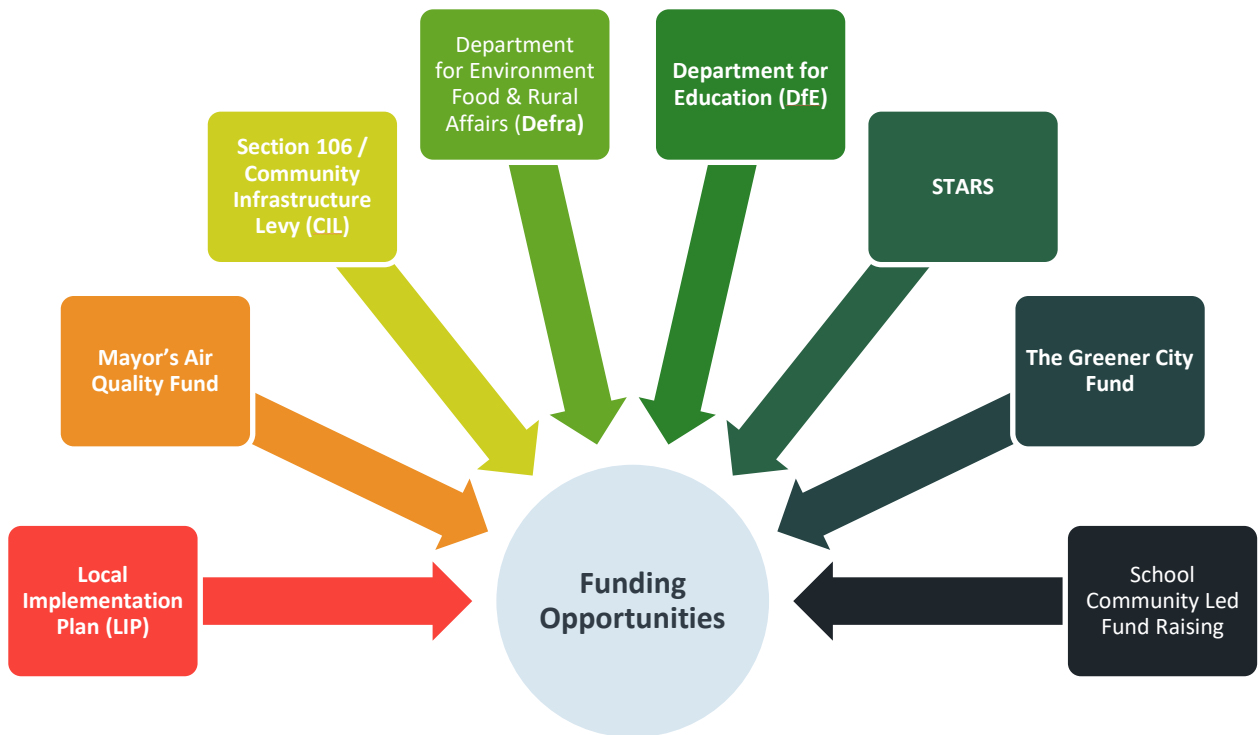
### **Wider Measures**

- **Wider measures** – as background emissions and strategic roads are the main sources of emissions around many of the schools, it was important to include some wider strategic recommendations, in conjunction with more localised measures. These recommendations included a number of London-wide and national level interventions, including a targeted scrappage scheme for polluting vehicles, reforming Vehicle Excise Duty, promoting a transition to electric heating and heat pumps, reforming buildings regulations to promote heat pumps, and introducing zero emission zones in central London and across town centres, and larger inner London and London-wide zones in the longer term.
- **Ultra-low Emission Zone (ULEZ) & Low Emission Zone (LEZ)** - Engage with discussions on the Mayor of London's plans to expand the ULEZ to the North and South Circular Roads from 2021, and other consultations on air quality affecting their school or neighbourhood. The introduction of the ULEZ in central London in April 2019 and the proposed expansion of the ULEZ up to the North/South circular for all vehicles and the tightened emission standards for the Low Emission Zone for buses, coaches and lorries across the whole of London (subject to consultation) will significantly improve air quality.

## 7.2 FUNDING OPPORTUNITIES

7.2.1. A wide range of potential funding sources were identified and collated, at the time of writing, to support stakeholders in taking forwards some of the measures outlined above, as set out in the figure below.

**Figure 11 – Summary of funding opportunities**



7.2.2. Below, we discuss each of these in turn and set out the criteria associated with obtaining these funding opportunities, to enable boroughs / schools to understand what measures they could progress with the funding opportunities that exists.

### Local Implementation Plan (LIP)

7.2.3. A primary source of funding is linked to the Local Implementation Plan (LIP) 3 that will provide spending from April 2019 until April 2020, with bidding closing in October 2018. The guidance on bidding specifically references the need to improve air quality at schools:

*'2.34 In the short- to medium-term, there must be a particular focus on action to reduce air, pollution, reducing exposure to it and tackling pollution hotspots, which boroughs should support through their LIP. Locations that have large numbers of vulnerable Londoners, such as schools, should be prioritised for action. In particular, the boroughs have an important role in ensuring recommendations from the Mayor's school air quality audit programme are implemented, and LIP funding can be directed at both the audits and the delivery of measures.'*

7.2.4. It is expected that recommendations from the audits can be implemented by the London boroughs using funding from TfL's Local Implementation Plan (LIP) funding stream, but this is subject to

boroughs prioritising this area. It is ultimately at the discretion of the boroughs to follow this guidance and allocate money to fund the measures outlined above.

7.2.5. Whilst the Mayor has allocated funding for the first 50 audits, he expects the London boroughs to roll this out so that every school that is located in an area of high pollution can benefit from this approach. LIP funds are a source of funding for this, and the guidance developed alongside the audit toolkit and template can be used locally to complete school air quality audits for other schools.

**Mayor's Air Quality Fund (MAQF)**

7.2.6. The MAQF is a £20 million fund, over ten years to support new projects by London boroughs to improve air quality. The first round of funding supported a wide range of projects, including: freight consolidation, green walls, low emission vehicles, reducing pollution from construction sites and digital signage to reduce engine idling.

7.2.7. In summer 2018, the third round of MAQF funding will open for applications (for projects commencing in April 2019).

**Section 106 / Community Infrastructure Levy (CIL)**

7.2.8. Section 106 (S106) agreements and Community Infrastructure Levy (CIL) are potential sources of funding towards measures to address local air pollution.

7.2.9. S106 agreements, also known as planning obligations, are legal agreements made between local authorities and developers, and designed to address issues that new developments may cause or worsen on local infrastructure. The content of a S106 agreement is agreed during the consultation period of the planning application and the agreement is prepared by the council's solicitor.

7.2.10. A Community Infrastructure Levy (CIL) is a planning charge introduced by the government via the Planning Act 2008. It provides a means of ensuring that a new development contributes to the cost of the infrastructure that the development will rely on, such as schools and roads.

7.2.11. The levy applies to most new buildings and charges are based on the size and type of the floor space being created. The idea behind the CIL is that it's fairer, faster and more certain than the system of S106 planning obligations, which are negotiated on a case-by-case basis and that contributions can be sought in accordance with local policy objectives.

**Liveable Neighbourhoods**

7.2.12. A Liveable Neighbourhood scheme will deliver attractive, healthy and safe neighbourhoods for people and involves changes to improve conditions for walking and cycling and reducing traffic dominance – all of which can play a part in reducing air pollution. The types of measures that can be funded via this programme may include new pedestrian crossings, a network of good cycle routes, redesigned junctions, restrictions on motor traffic in town centres as well as wider improvements against each of the ten Healthy Streets Indicators.



- 7.2.13. The programme has a budget totalling £85.9m over the five financial years (2017/18 – 2021/22), excluding the funding for the remaining Major Schemes that will be completed during this period. Although costs will vary considerably from scheme to scheme, it is expected that TfL contributions for most schemes will fall within a range of £1m to £10m, with the majority probably under £5m.

**Department for Environment Food & Rural Affairs (Defra) Air Quality Grant Scheme**

- 7.2.14. Defra's air quality grant scheme provides funding to eligible local authorities to help improve air quality. The scheme helps local authorities to make air quality improvements and to meet their statutory duties under the Environment Act 1995. It has awarded over £52 million in funding to a variety of projects since it started in 1997.
- 7.2.15. It is noted that the applications for 2017 to 2018 has now passed (December 2017) but it is recommended that Local Authorities submit future applications to implement some of the measures outlined within this report. It is noted that LA's have previously successfully applied for funding some behavioural / awareness raising measures. For example, the London borough of Islington was awarded £50,000 as part of a school focussed awareness and engagement campaign.

**Department for Education (DfE)**

- 7.2.16. There may be scope for delivering some of the measures identified through DfE funding for school buildings and land, including capital funding for schools and academies, such as the Condition Improvement Fund, Priority School Building Programme, Early Years Capital Fund.

- 7.2.17. Additionally, the Salix Energy Efficiency Loan Scheme provides funding for schools and colleges through DfE, to reduce energy costs through the installation of energy efficiency technologies. This funding would apply to measures designed to reduce emissions through improving building energy use – such as replacing an older boiler with a heat pump, or increasing building insulation. To receive funding a project would need to save energy as well as improve air quality, and energy savings would need to have a payback period of eight years or less. In addition, the project must not exceed a maximum cost of £200 per tonne of CO2 saved.



**Greener City Fund**

- 7.2.18. The Mayor's Greener City Fund ([www.london.gov.uk/greenercity](http://www.london.gov.uk/greenercity)) includes a range of programmes to create and improve green spaces and encourage tree planting in London. This is part of the Mayor's commitment to making a London a National Park City.

- 7.2.19. The Mayor wants local boroughs to work with the audited schools to take forward the recommendations, and they can use funding provided by TfL for local road improvements for this purpose. He is also providing additional funding to help the audited schools implement improvements inside their school. Each school will receive £10,000 (which we hope the local borough will match), and there are other funds which the school can apply to, such as the Greener City Fund to deliver greening measures.

- 7.2.20. There will be £1,050,000 in additional funding. This is divided as follows:

- £500,000 to deliver the non-transport interventions at all 50 audited schools. Each school will get £10,000 from the GLA which we will ask to be matched by the school or borough. (There is also separate funding to deliver transport recommendations from TfL LIP funding);



- At least £300,000 is ring-fenced for schools to deliver green infrastructure at any school which is located in an area exceeding legal pollution limits; with the potential for further funding where there is a well-developed bid.
- £250,000 in funding to launch a new nursery audit programme at 20 nurseries in the most polluted areas. This will trial filtration systems.

#### RE:FIT

- 7.2.21. RE:FIT London is jointly funded by the GLA and the European Union European Regional Development Fund, and is helping to achieve the Mayor's aim for London to be a zero carbon city by 2050 as part of the Mayor's £34m Energy for Londoners programme. RE:FIT is designed to help public sector organisations save carbon, energy and money by retrofitting buildings to make them more energy efficient, from simple measures like lighting and controls to solar panels. Since it was established in 2009 the programme has not only reduced carbon emissions, but also resulted in large guaranteed energy savings (typically around 15-25%).
- 7.2.22. The RE:FIT London Programme Delivery Unit is an expert team which provides free end to end support to deliver projects.
- 7.2.23. The RE:FIT framework of energy service companies saves time and resources for organisations that are procuring retrofit services and works and – because it is an energy performance contracting framework - guarantees energy and cost savings. Schools in particular benefit from being able to procure through this framework via a fast-track route. Further information is available at [www.london.gov.uk/refit](http://www.london.gov.uk/refit)

#### TfL STARS Reward Scheme

- 7.2.24. Whilst there is no specific funding attached to STARS, as gaining STARS accreditation helps boroughs to achieve their targets for reducing school related car travel, and increasing cycling and walking, they often choose to link it to incentives – such as local grant funding through their LIP programmes and priority access to other opportunities.
- 7.2.25. It is important for boroughs to highlight that a possible benefit of getting STARS Accreditation is that it will potentially enable them to access funding for a variety of measures that contribute towards improving air quality and health. In broad terms, funding can be secured if the proposed measure:

- Promotes one aspect of safer and smarter travel choices (walking, cycling, scooting, safer / smarter driving, public transport and road safety).
- Helps the school reduce congestion (and pollution) in the vicinity of the school.

- 7.2.26. Ideas include, but are not limited to:

- Training – pedestrian skills, scooter safety, balance bike, cycling
- Cycling – storage, helmets, pool bikes, bike market, Dr Bike
- Resources – sustainable travel and road safety books, reflective and fluorescent products
- Staffing – supply cover to allow STP staff training and workshop attendance.

- 7.2.27. It is increasingly important that boroughs seek to create a portfolio of funding opportunities, and with that in mind other potential funding sources include:

- **Local Clinical Commissioning Groups.(CCG)** - <https://www.nhscc.org/ccgs/>

- **Health and Wellbeing Boards:**  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/215261/dh\\_131733.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/215261/dh_131733.pdf)
- **Charitable Trusts**
- **Local business funding**
- **Consortium approach** – pooling funding with other boroughs and achieve economies of scale

### Other Funding Sources

- 7.2.28. There are several grant funding bodies who may be interested in funding recommendations particularly if a borough links up with a community organisation -  
<https://www.dsc.org.uk/category/fundraising/funding-sources/>
- 7.2.29. Boroughs could also seek to influence the Joint Strategic Needs Assessment process undertaken by Health and Well Being Boards and Directors of Public Health. This is the process which looks at local clinical, health and well-being population needs, and on which CCGs base their funding priorities.

### Other sources of funding for green infrastructure

- 7.2.30. Potential sources of funding for green infrastructure in schools include:
- The Tree Council's **Trees for Schools** programme offers grants between £100 and £700 to fund tree planting [www.treecouncil.org.uk/grants/trees-for-schools](http://www.treecouncil.org.uk/grants/trees-for-schools)
  - The **Woodland Trust** offers free trees for schools [www.woodlandtrust.org.uk/get-involved/schools/trees-for-schools/](http://www.woodlandtrust.org.uk/get-involved/schools/trees-for-schools/)
  - The **Gregg's Foundation Environmental Grants** offer up to £2,000 for projects that improve the physical environment in a way that will improve people's lives, including in schools where the project is accessible to the wider community [www.greggsfoundation.org.uk/environmental-grant](http://www.greggsfoundation.org.uk/environmental-grant)
  - **Tesco Bags of Help** offer up to £4,000 to a wide range of projects, including environmental improvements to school grounds [www.groundwork.org.uk/Sites/tescocommunityscheme](http://www.groundwork.org.uk/Sites/tescocommunityscheme)
  - **The Big Lottery Fund's Awards for All programme** offers up to £10,000 for a wide range of projects that "improve the places and spaces that matter to communities", including schools [www.biglotteryfund.org.uk](http://www.biglotteryfund.org.uk)
  - **Learning Through Landscapes Nature Grants Scheme** – grants will re-open in Spring 2018 [www.ltl.org.uk/naturegrants](http://www.ltl.org.uk/naturegrants)
  - **Trees for Cities** – are a charity able to match-fund the remaining shortfall after the financial contribution towards the project from the land owner. Their most notable schools programme is the Edible Playgrounds programme, which includes the design and creation of an edible teaching garden space within school grounds. Their other programmes include School Greening projects (mini forest style spaces, wildlife areas, biodiversity features) and Trees for Schools, a programme funded by Defra and delivered in partnership with the Woodland Trust. <https://treesforcities.org/projects/schools/>
  - **Groundwork London** – are an environmental regeneration charity specialising in community-based green interventions and behaviour change, with a team of landscape architects and community officers who can support schools in designing and implementing green interventions, supporting the curriculum and taking a 'whole school' approach to understanding air quality. They also manage programmes that could offer funding for schools in considering their interventions, and fundraising support. Contact [londonairquality@groundwork.org.uk](mailto:londonairquality@groundwork.org.uk), [www.groundwork.org.uk/london](http://www.groundwork.org.uk/london).

### School Community Led Fund Raising Initiatives

- 7.2.31. As well as the specific funding opportunities outlined above, there is an important role for Schools, Ward Councillors, the Parent's Teachers Associations (PTA) and School Governors, both in a lobbying and leadership capacity, and as vehicles for fundraising to support and promote particular measures and initiatives.

## 7.3 MONITORING

- 7.3.1. An important outcome of the school air quality audits will be in assessing the effectiveness of different schemes and initiatives implemented, so that the findings can be used to continually update and refine the toolkit of measures for use in future audits.
- 7.3.2. In order to undertake these assessments and build on the existing evidence available, it will be essential to establish an effective baseline dataset, and plan a programme of monitoring post implementation of any measures.
- 7.3.3. Any such monitoring should cover:
- Key pollutants (NO<sub>x</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>), and
  - a range of other suitable metrics (i.e. travel to school mode shares, STARS and Healthy Schools accreditations, traffic counts (as a proxy for road transport emissions), school buildings and boiler conditions).
- 7.3.4. Whilst it will likely prove difficult to disaggregate the impact of a range of measures when implemented simultaneously, by recording this information across all participating schools in London, and pooling the findings, it will provide some useful overall insights into what types of solutions work best in practice amongst a given set of conditions.
- 7.3.5. The scope for monitoring can be proportionate to the extent of the problem and the scale of the investment.
- 7.3.6. The Mayor recently announced the trial of new air quality monitoring sensors in up to 1,000 hot spots across London, including schools, as well as fleet of mobile sensors, which if successful may be used to monitor localised air quality around the school, in addition to the network of existing monitors when already located near the school.
- 7.3.7. The GLA will be seeking to maintain the dialogue with boroughs, and to facilitate the sharing of findings and experiences as different measures and initiatives are implemented following the audits. This will enable an assessment of their effectiveness in reducing sources of, or exposure to, local air pollution. It is envisaged this will take place 6-12 months after the audit programme is concluded.

## **Chapter 8 – Summary and Next Steps**

## 8 SUMMARY AND NEXT STEPS

### 8.1 SUMMARY

8.1.1. In summary the air quality audit programme has:

- Identified the sources of outdoor air quality and potential exposure by primary school children at the schools and their surrounding catchment areas, and potential indoor exposure through the internal audits.
- Reviewed, evaluated and recommended a combination of hard hitting measures and pragmatic approaches, both within and around the school to help a borough to reduce emissions or reduce primary school children's exposure to poor air quality at those sites, which could be delivered as part of the boroughs' Local Implementation Plan (LIP) funding schemes, as well as other sources of funding such Clinical Commissioning Groups, local businesses and charitable trusts
- Engaged school communities, including in a review of their TfL STARS travel plan, educating stakeholders about the impacts of air pollution and providing recommendations on activities, initiatives and policies that the primary schools could implement to further reduce emissions and/or exposure.
- Engaged with the boroughs to inform the feasibility of the proposed recommendations.
- Developed recommendations for the boroughs consideration and future implementation, and wider dissemination.

8.1.1. The air quality audit programme has developed a wide ranging combination of **hard-hitting measures** and **quick-win solutions** to help protect pupils' health from toxic air quality at 50 of London's most polluted primary schools, and examined new ways to lower emissions and exposure to pollution in and around the schools.

8.1.2. Beyond the 50 schools audited as part of the project, it has also served to **establish a replicable approach** and process for undertaking future school air quality audits, with audit templates and a toolkit of measures, which can benefit other schools suffering from poor local air quality.

8.1.3. The project is an example of the **joined up multidisciplinary approach** needed to address the challenges posed by poor air quality, drawing on expertise from transport planning, air quality and buildings and energy efficiency specialists, and engaging closely with borough council, Greater London Authority and Transport for London representatives spanning air quality, transport, education and school travel, and most fundamentally the schools and children themselves. The school air quality audit approach has recently been cited and **recommended within the Chief Medical Officers annual report** on the Health Impacts of Pollution<sup>11</sup>:

8.1.4. Based on our experiences in undertaking the audits, we found there to be a passionate group



<sup>11</sup> Annual Report the Chief Medical Officer 2017, Health Impacts of All Pollution – what do we know?

of individuals representing the schools and the borough councils, who were eager to make a difference, and enthusiastic about delivering a range of solutions to improve local air quality for the children, and the wider community as a whole.

- 8.1.5. We heard examples of the real issues experienced by children and teachers alike when subjected to toxic air quality, and through the engagement activities undertaken as part of the programme, it was clear the children were genuinely interested and keen to engage with the issue of air quality, consistently asking intelligent questions and offering good ideas, and so inspiring the next generation of air quality champions.

## 8.2 NEXT STEPS

- 8.2.1. A series of presentations on the findings of the audits will follow the publication of the reports in May 2018, with the Mayor again playing a key role in publicising the project, in order to continue to raise awareness around the issue of air quality.



- 8.2.2. The boroughs and key stakeholders should investigate the scope for rapidly delivering key measures from the recommendations, in order to achieve a combination of quick win improvements for the school, but also thinking more holistically about how some of the medium to longer term recommendations can be progressed, to deliver transformational change, to the lasting benefit of future generations.'
- 8.2.3. In order to take forwards the recommendations identified within this report, the borough councils will need to continue to work closely with the schools and local communities, building on the relationships already in place.
- 8.2.4. The possible exposure to air pollution at each school has been assessed taking into account a number of factors including modelled NO<sub>2</sub> concentrations in the vicinity of each school and the number of pupils. As a next step more detailed, location specific assessments of exposure at each school, or on the routes frequently used by parents and pupils on their way to school, could be undertaken by making measurements at the school façade or by using personal monitors to measure exposure on the approaches to school. This work should be undertaken with input from the boroughs and would ensure that the appropriate air quality objectives are considered at each school. This would **ensure that resources are targeted** at routes where exposure to air pollution is the greatest for children and their parents.
- 8.2.5. A **wide range of potential funding** sources are identified within the report, and borough councils and schools are encouraged to apply for these where appropriate to maximise the potential for delivering the recommendations.
- 8.2.6. The Schools and wider school communities, including School Governors, have an important **leadership role** in ensuring that measures to reduce exposure and emissions are included in the schools strategic plans.

- 8.2.7. **STARS** is an ongoing process, and the schools should continue working towards the targets they have set, and continue adding to their air quality related activities, and uploading evidence to contribute towards achieving and sustaining higher levels of accreditation.
- 8.2.8. An important outcome from this project will be to **build on our knowledge** of how effective different measures prove to be over time, so that the findings can be used to continually update and refine the toolkit of measures for use in future audits.
- 8.2.9. The GLA is exploring whether boroughs can report on the implementation of school air quality recommendations through the London Local Air Quality Management framework.
- 8.2.10. We also hope that the boroughs and schools will come together as part of a proposed newly established wider School Air Quality forum, proposed as an outcome of this programme, and at the suggestion of a number of the participating schools and boroughs, to share their experiences with others facing similar challenges. It is proposed that the presentations on the findings of these reports can effectively be the first in this enduring series of School Air Quality Forum meetings, as a legacy of this programme.

## **Appendix A – The Mayor's commitment to improving air quality: Key Documents**



## The Mayor's commitment to improving air quality: Key Documents

The Mayor is implementing a significant programme of measures to reduce London's deadly air pollution and protect the health and wellbeing of all Londoners, enshrined within the following key documents:

- **The London Environment Strategy** – a bold and ambitious strategy, with a particular focus on air quality. This is the first strategy to bring together approaches to every aspect of London's environment, including: air quality, green infrastructure, climate change mitigation and energy, waste, adapting to climate change and ambient noise.  
[https://www.london.gov.uk/sites/default/files/london\\_environment\\_strategy\\_draft\\_for\\_public\\_consultation.pdf](https://www.london.gov.uk/sites/default/files/london_environment_strategy_draft_for_public_consultation.pdf)
- **The Draft London Plan** - published in November 2017, places a considerable emphasis on air quality, with policy S|1 stating that London's air quality should be significantly improved, and exposure to poor air quality, especially for vulnerable people, should be reduced.  
<https://www.london.gov.uk/what-we-do/planning/london-plan>
- **The Mayor's Transport Strategy 2018** - The Mayor has set out ambitious plans to improve transport in London over the next 25 years in his draft Transport Strategy. It includes record investment in new and improved rail, tube and bus services, an unprecedented focus on walking and cycling, and a commitment to make the entire transport system zero-emission by 2050.  
<https://www.london.gov.uk/sites/default/files/mayors-transport-strategy-2018.pdf>
- **Expanding the Ultra Low Emission Zone (ULEZ) and tightening the Low Emission Zone (LEZ)**  
[https://consultations.tfl.gov.uk/environment/air-quality-consultation-phase-3b/user\\_uploads/supporting-information-document-updated-12.12.17.pdf](https://consultations.tfl.gov.uk/environment/air-quality-consultation-phase-3b/user_uploads/supporting-information-document-updated-12.12.17.pdf)

A wide range of further information, guidance, funding and useful literature is available to support further studies, schemes or initiatives with the aim of improving local air quality, including, but not limited to:

- **Local Authorities and Air Quality** – A summary by the GLA of action taken by London boroughs to improve air quality -  
[https://www.london.gov.uk/sites/default/files/borough\\_air\\_quality\\_report\\_2017\\_final\\_2.pdf](https://www.london.gov.uk/sites/default/files/borough_air_quality_report_2017_final_2.pdf)
- **Updated Analysis of Air Pollution Exposure in London** – GLA  
[https://www.london.gov.uk/sites/default/files/aether\\_updated\\_london\\_air\\_pollution\\_exposure\\_final\\_20-2-17.pdf](https://www.london.gov.uk/sites/default/files/aether_updated_london_air_pollution_exposure_final_20-2-17.pdf)
- **British Lung Foundation** - Air Pollution Guidance for School Staff  
([https://neu.org.uk/system/files\\_force/publication-files/NEU%20BHF%20air%20pollution%20guidance%20FINAL.PDF?download=1](https://neu.org.uk/system/files_force/publication-files/NEU%20BHF%20air%20pollution%20guidance%20FINAL.PDF?download=1))
- **Guidelines on ventilation, thermal comfort, and indoor air quality in schools** – DfE -  
<https://www.gov.uk/government/consultations/ventilation-thermal-comfort-and-indoor-air-quality-in-schools>
- **Better Places for People** (World Green Building Council) – Indoor Air Quality at Schools -  
<http://www.worldgbc.org/sites/default/files/Better%20Places%20for%20People%20-%20Schools%20Briefing%20Notes%20-IAQ.pdf>
- **Air quality alerts** - Each school has been provided with further information via email on what the alert means, and how to reduce pupils' personal exposure [AirQualityLondon@london.gov.uk](mailto:AirQualityLondon@london.gov.uk)
- **Control of Dust and Emissions during Construction and Demolition SPG** prepared by the GLA, which includes requirements for construction sites to monitor air quality and share the results with the borough – <https://www.london.gov.uk/what-we-do/planning/implementing-london-plan/supplementary-planning-guidance/control-dust-and>
- **The Mayor's Greener City Fund** - [www.london.gov.uk/greenercity](http://www.london.gov.uk/greenercity)
- **RE:FIT London** - jointly funded by the GLA and the European Union European Regional Development Fund, and helping to achieve the Mayor's aim for London to be a zero carbon city by 2050 as part of the Mayor's £34m Energy for Londoners programme. The programme is designed to help public sector organisations save carbon, energy and money by retrofitting buildings to make them more energy efficient. The RE:FIT framework of energy service companies saves time and resources procuring retrofit services and works. Schools in particular benefit from being able to procure through this framework via a fast-track route. Further information is available at [www.london.gov.uk/refit](http://www.london.gov.uk/refit)

**MAYOR OF LONDON**

## **Appendix B – Audit Template**

# SCHOOL AIR QUALITY AUDIT TEMPLATE

## School Name:

Address:

Key Telephone Contact:

Key Email Contact:

Head Teacher:

School Staff (name/role):

School Staff (name/role):

School Staff (name/role):

Borough Name:

Sub-region:

Borough AQ Officer:

Borough TP Officer:

Borough School Transport Officer:

WSP Auditor/s:



Audit Date:

Audit Time:

Weather Conditions:

Any exceptional circumstances:

Notable Events/ Traffic incidents:

## Background Information

1. Pupil Numbers:
2. Building Description
3. School Building Age
  - a. Any extensions (building age)
  - b. Any planned growth?
  - c. BREEAM rating (if available)
4. Mode share and trip numbers, recent trends
  - a. Walk
  - b. Cycle
  - c. Public Transport
  - d. Car
  - e. Other
5. STARS status:

## 6. Local Area Type

- a. City Centre
- b. Major Centre
- c. Metropolitan Centre
- d. Suburban
- e. Residential

## 7. Road Type

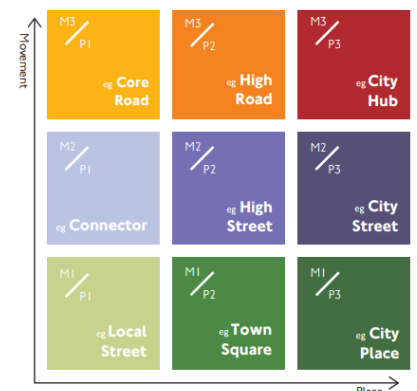
- a. TLRN Road
- b. Main Road
- c. Near Main Road
- d. Residential Street
- e. Cul-de-sac

## 9. Proximity to Road

Distance to largest adjacent road (m):

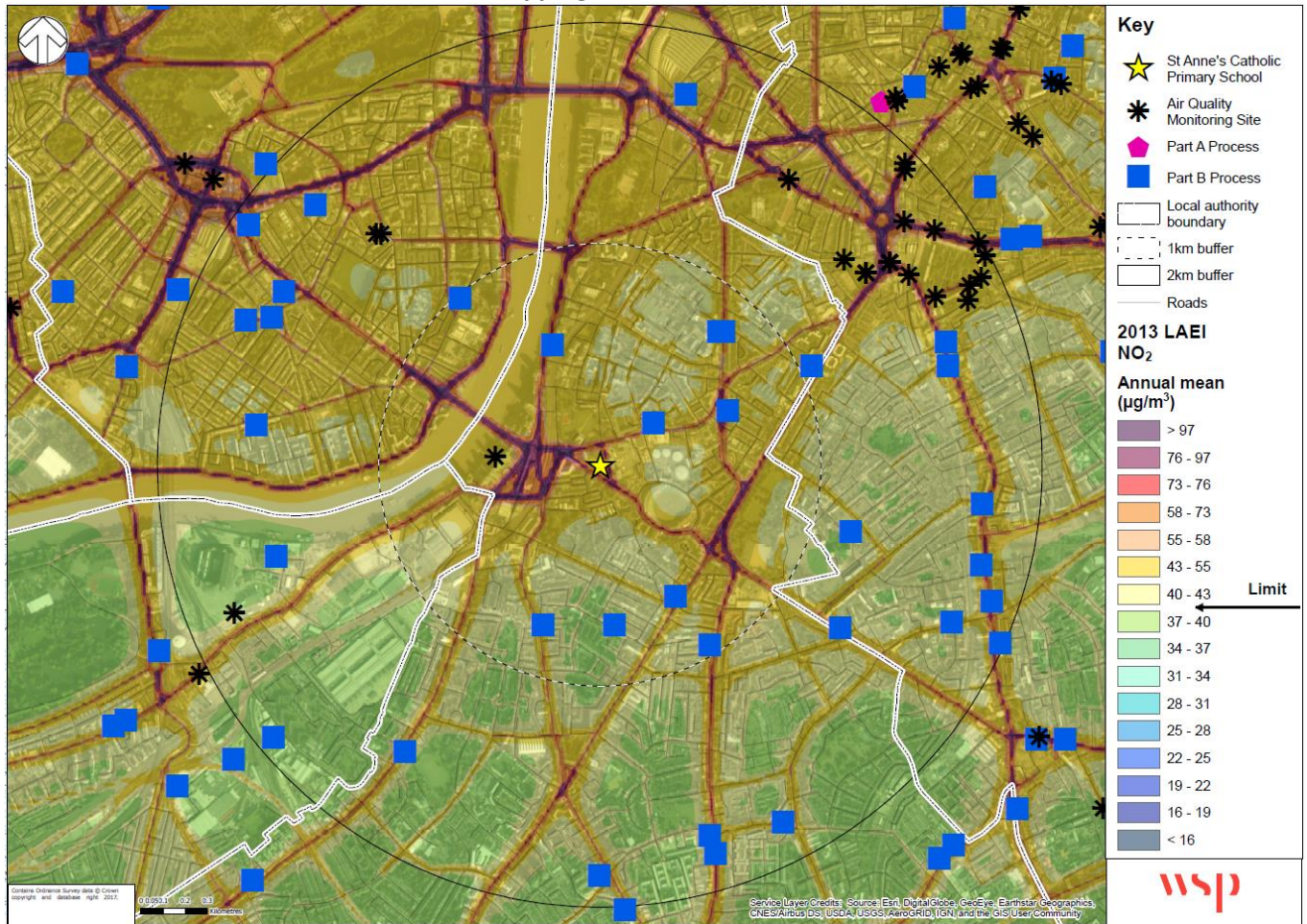
## 10. Context Notes from School/Borough:

## 8. Street Type (Movement/Place)

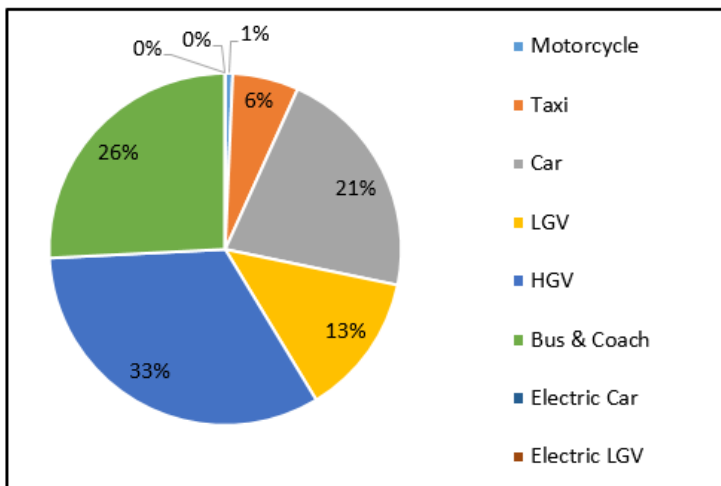


# AIR QUALITY MODELLING RESULTS

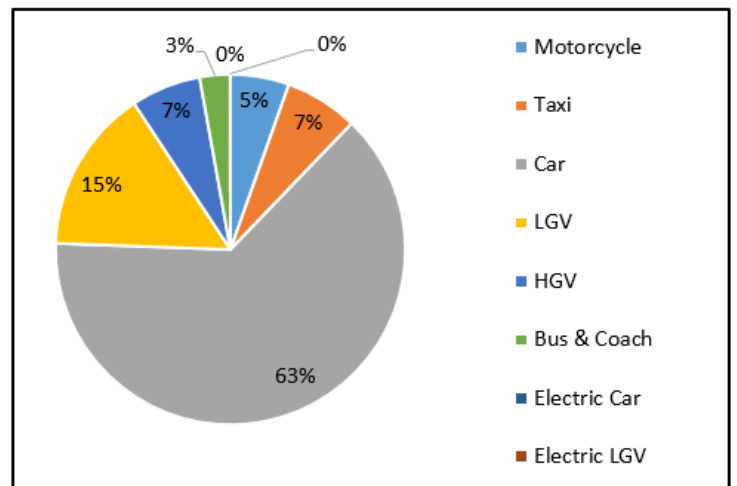
## NO2 Mapping



## Road Transport Emissions – Split by Source Sector



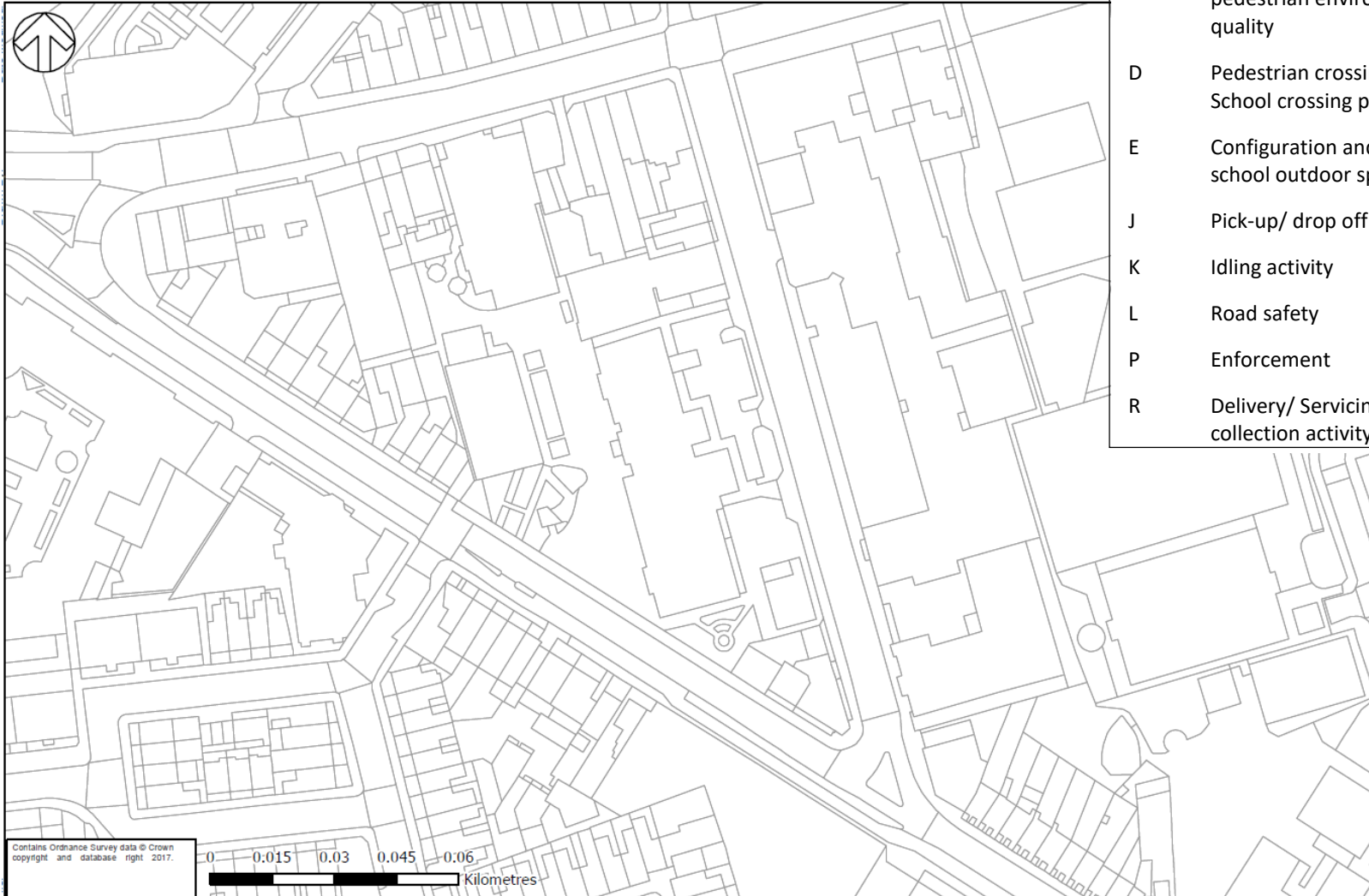
## Road Transport Volumes (Split by Type)



# SCHOOL GROUNDS AUDIT CHECKLIST

- 1) Work through checklist - Label each observation/issue with applicable letter (A, B, C)
- 2) Add number prefix if multiple (A1, A2)
- 3) Verify context plan – i.e. bus stop, tube station locations

School Grounds Checklist		S	School Visitor parking
A	Vehicle access & egresses	T	School Staff parking
B	Pedestrian access & egresses	U	School Vehicles (i.e. Minibus)
C	Key walking routes and pedestrian environment quality	V	Other Parking
		Y	Cycling environment quality
D	Pedestrian crossings/ School crossing patrols	Z	Extent of Trees/ Shrubs/ Green barriers
E	Configuration and use of school outdoor space	*	Emissions from on-site energy generating plant
J	Pick-up/ drop off activity	+	Localised industrial sources
K	Idling activity	!	Construction activity
L	Road safety	#	Street canyons
P	Enforcement		
R	Delivery/ Servicing/ waste collection activity		



<b>SCHOOL GROUNDS OBSERVATION NOTES</b>	<b>Source</b> (i.e. factors influencing output of harmful emissions)	<b>Exposure</b> (i.e. factors influencing movement of children through an area, or waiting in an area)	<b>Feedback Notes</b> (i.e. from consultations, during observations/brainstorming session)
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# SCHOOL APPROACHES AUDIT CHECKLIST

- 1) Work through checklist - Label each observation/issue with applicable letter (A, B, C)
- 2) Add number prefix if multiple (A1, A2)
- 3) Verify context plan – i.e. bus stop, tube station locations



## School Approaches Checklist

- C Key walking routes and pedestrian environment quality
- D Pedestrian crossings/ School crossing patrols
- F Other pedestrian waiting spaces
- G Traffic volumes, flow and composition
- H Congested junctions
- I Road widths, speed limit and traffic calming measures
- J Pick-up/ drop off activity
- K Idling activity
- L Road safety
- M Road access restrictions
- N School Keep Clear hatching
- O Waiting and Loading restrictions
- P Enforcement
- Q Bus stops/ Coach stops
- R Delivery/ Servicing/ waste collection activity
- S School Visitor parking
- T School Staff parking
- U School Vehicles (i.e. Minibus)
- V Other Parking
- W On-street parking restrictions
- X Key nearby attractors/ traffic generators
- Y Cycling environment quality
- Z Extent of Trees/ Shrubs/ Green barriers
- \* Emissions from off-site energy generating plant
- + Localised industrial sources
- ! Construction activity
- # Street canyons

<b>SCHOOL APPROACHES OBSERVATION NOTES</b>	<b>Source</b> (i.e. factors influencing output of harmful emissions)	<b>Exposure</b> (i.e. factors influencing movement of children through an area, or waiting in an area)	<b>Feedback Notes</b> (i.e. from consultations, during observations/brainstorming session)
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## EXTERNAL CHECKLIST FACTORS – GUIDANCE FOR AUDITORS

Checklist Factors	Description	School Grounds	School Approaches
A	Vehicle access & egresses	Level of activity (indic % of total movements)	x
B	Pedestrian access & egresses	Level of activity (indic % of total movements)	x
C	Key walking routes and pedestrian environment quality	Pedestrian Desire lines catered for? Footway widths (distance of peds from carriageway). Barriers/ obstacles to walking? Lighting? Public realm quality? Pedestrians from all walks of life? Shade and shelter? Places to stop and rest? Not too noisy? People feel safe? Things to see and do? People feel relaxed?	x
D	Pedestrian crossings/ School crossing patrols	Proximity to emissions sources? Safety. Convenience. Routed over crossing in proximity to traffic emissions? Wait time? Maintenance condition? Personal safety? Accessibility?	x
E	Configuration and use of school outdoor space	Playgrounds, outdoor spaces. Proximity to emissions sources, particularly where children are exposed for longer durations. Where do children spend time outside, during breaks, PE, queuing, off-site? Differ by age groups?	x
F	Other pedestrian waiting spaces	i.e. outside the school gates, other areas children/parents wait	x
G	Traffic volumes, flow and composition	HGVs? LGVs? Taxis? ULEVs? Nature of flow – speed, stop-start?	x
H	Congested junctions	Congested - resulting in queuing vehicles, stop-start traffic and additional emissions?	x
I	Road widths, speed limit and traffic calming measures	Conducive to speeding, long crossing distances? Hostile/ unsafe?	x
J	Pick-up/ drop off activity	Drop off location/ activity	x
K	Idling activity	Where do vehicles idle, type, approx age, time, duration	x
L	Road safety	Illegal or undesirable manoeuvring, pedestrian accident data	x
M	Road access restrictions	Pedestrian Zones? No Motor Vehicles? Time based access restrictions?	x
N	School Keep Clear hatching	Where? Observed/ enforced?	x
O	Waiting /Loading restrictions	Single, double yellow lines? Kerb blips? Signage	x
P	Enforcement	How well are restrictions obeyed/ enforced?	x
Q	Bus stops/ Coach stops	Where do vehicles stop, type, approx age, time, duration? Which are used by children, where do children wait?	x
R	Delivery/ Servicing/ waste collection activity	Delivery to school or other site? Vehicle types, routing, timings, goods, locations	x
S	School Visitor parking	Where, how many, vehicle mix, active during visit	x
T	School Staff parking	Where, how many, vehicle mix, active during visit	x
U	School Vehicles (i.e. Minibus)	Where, how many, vehicle mix, active during visit	x
V	Other Parking	Nearby Resident/ P+D/ Business. Parking On-street/ off-street? Utilisation? Activity?	x
W	On-street parking restrictions	Resident Permit holder only? Business Permit holder? P+D? Unrestricted?	x
X	Key nearby attractors/ traffic generators	i.e. employment, supermarkets, shops, stations	x
Y	Cycling environment quality	Cycle parking? Evidence of demand? Cycle friendly/hostile? Cycle routes?	x
Z	Extent of Trees/ Shrubs/ Green barriers	Presence of planting and screening from roads	x
*	Emissions from on-site/ off-site energy generating plant	Gas-fired boilers and CHP Units	x
+	Localised industrial sources	Look out for additional part B sources not mapped – i.e. Dry cleaners, takeaway's etc. Car garages – painting cars	x
!	Construction activity	Are there any construction sites? Construction traffic routing? Visible dust? Visible dust suppression/monitoring in place?	x
#	Street canyons	Where building height on both sides of the road is greater than road width	x


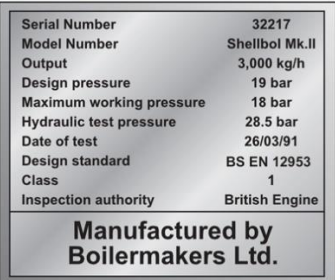
## SCHOOL BUILDING AUDIT CHECKLIST




Mark on plant room (i.e. Boiler Room).

<b>Internal Layout</b>	
Layout of building – class rooms and other rooms and exposure to emissions sources	Mark onto map – classrooms/assembly hall/staff room i.e. you could have store rooms or staff offices nearer the roads rather than classrooms. Class room windows fronting onto main road?

<b>Heating</b>	
Heat source type	e.g. gas boiler, heat pump, biomass boiler (wood fired, pellet fired, bio-diesel). Back up diesel generator?
Number	e.g. 3
Heating only or heating & hot water?	
Central or Distributed	i.e. single plant room or smaller local boilers
If central, common flue	i.e. do all the boilers run into a single large flue, or multiple small flues

<p>Height of flue?</p> 	<p>Take a picture</p> <p>Short - &lt;1m (i.e. similar to domestic boiler length of flue)  Medium – 1m to 2m (small to medium commercial boiler size of flue)  Tall – &gt;3m (for larger boilers)</p>
Boiler age	
Boiler manufacturer	
Boiler model	
Boiler Rating (kW output)	
<p>Insert picture of rating plate</p> 	<p>Take a picture – includes info on boiler age, manufacturer, model, rating.</p>
Boiler condition	(fair, poor, excellent etc.)
Supply fan? Variable speed?	(Sending air into boiler)
Boiler control system	Advanced (digital, PC) or manual?
Air Conditioning?	If so is it used – at what times of year and how frequently?
Local Heaters?	Standalone heaters around the school?
Are these used?	(e.g. in sports hall)
If yes, what kind?	Convection (warm air blower), radiant?
Fuel source	Gas or electric
Flue system	I.e. flue to outside building?
Control system	Simple, or advanced (e.g. tied to PC)
Maintenance Regularity	

<b>Ventilation</b>	
Form	i.e. centralised (air handling units), passive (windows)
If windows then	Do any of the classroom windows which are regularly opened for ventilation or cooling purposes, front onto pollution sources (i.e. main roads)?
If centralised system then	i.e. air handling units?
Air Handling Units  <p>An air handling unit; air flow is from the right to left in this case. Some AHU components shown are</p> <ul style="list-style-type: none"> <li>1 – Supply duct</li> <li>2 – Fan compartment</li> <li>3 – Vibration isolator ("flex joint")</li> <li>4 – Heating and/or cooling coil</li> <li>5 – Filter compartment</li> <li>6 – Mixed (recirculated + outside) air duct</li> </ul>	Single or multiple?
Fed from boiler or direct fired?	
Filters in place and changed regularly	should have bag and screen filters, changed at least every 6 months or on pressure difference
Air intake location	roof level?
Air intake suitable	clear of other vents, heat sources, extract outputs?
General condition of system	appears in good condition, average, dilapidated?
Extract from classrooms?	
Recirculation of extract air?	If so how much.

Control system	manual, PC (i.e. building management system)
Variable speed supply & extract?	Speed control on internal CO2 basis or temperature?

<b>Hot Water</b>	
Same as above or separate system?	
If separate:	
Gas or electric?	
Central or local?	i.e. one large central system or lots of small local water heaters
Control system?	i.e. timer, thermostat?
Well insulated?	must be greater than 25mm, ideally around 50mm on tank and pipework

<b>Kitchen</b>	
Extract system in place?	most likely extract from e.g. hobs
Extracts to...	Should exit to roof
Filtered?	Should have local filters for great if above hobs
Control System	Always on? On timed control?

<b>Internal Conditions</b>	
Incidence of overheating	Occasional/regular/severe + temperature
Fresh Air	Does it feel "stuffy"? Need more fresh air?
Green plants within building?	If so, where?
Damp or mould present?	If so, where and to what extent?

<b>Comments</b>

## STAKEHOLDER DISCUSSION POINTS:

- 1) Is there anything you would like to add or comment on regarding our recorded observations? Where do children spend time outside, during breaks, PE, queuing, off-site? Differ by age groups?
- 2) Any comments on recent trends/ issues regarding travel to school? Travel patterns of children and parents etc.
- 3) What do you feel are likely to be key sources of emissions in and around the school?
- 4) Where do you feel exposure to poor air quality is greatest in and around to school?
- 5) Key initiatives already underway to promote sustainable travel and reduce emissions? Which have worked well? Which haven't?
- 6) What more could the school do to lessen incidents of exposure and reduce sources of emissions?
- 7) Based on the toolkit of measures, and the findings of the observations and analysis, what are the top 3 measures you would prioritise for the school?
- 8) What sources of funding do you feel may be available to contribute towards localised schemes to address poor air quality at the school?
- 9) Is there any planned growth at the school (in terms of number of pupils or the school building/ grounds)?
- 10) Are there any notable committed developments planned in the local area?
- 11) To what extent do you feel issues relating air quality are well understood by the children, parents, teachers, local community, borough officers and decision makers?
- 12) Are you aware of the air quality related lesson materials available?
- 13) Any other activities or behaviours not observed today you would wish to highlight?
- 14) Can you provide us with a copy of the deliveries log for the week of the audit?

## STAKEHOLDER FEEDBACK NOTES:

## **Appendix C – Engagement Material**



## Supporting material for Air Quality related lessons

Bespoke material for each school is provided to add value to lessons with a focus on air quality and the environment, including:

- Map of air pollution at the school;
- Pie charts summarising the type of traffic near the school and how much air pollution is produced by which vehicles.

For example, this information could be used in conjunction with LSx Part 2: Investigating Air Quality whereby the objectives are listed as:

- Collecting scientific evidence
- Carrying out fieldwork investigations
- Making a labelled field sketch

The bespoke air quality modelling outputs for each school can add value to the lesson plan by being used to summarise the 'baseline' conditions prior to any measures being implemented and to identifying areas to target fieldwork investigations.

The pie charts illustrating the type of traffic near the school and how much air pollution is produced by which vehicles can contribute towards LSx Part 4: Action Planning whereby pupils learn about:

- How decisions and actions can affect the quality of people's lives
- Different ways in which people can improve their environment
- How to present a persuasive argument
- To make real choices and decisions

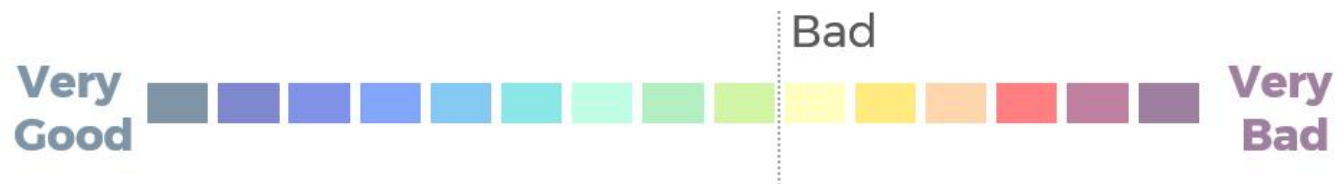
An understanding of how you travel to / from school (as well as other non-school related journeys) and the impacts it has on air quality can provide them with knowledge to travel via active means i.e. walking, scooting and cycling where possible.

The above can be linked to the National Curriculum, namely Science, Geography, PSHE / Citizenship and English Speaking and Listening. It is recommended that these lessons / materials are delivered by teaching staff as part of wider initiatives, such as National Clean Air Day.

### Relevant Links:

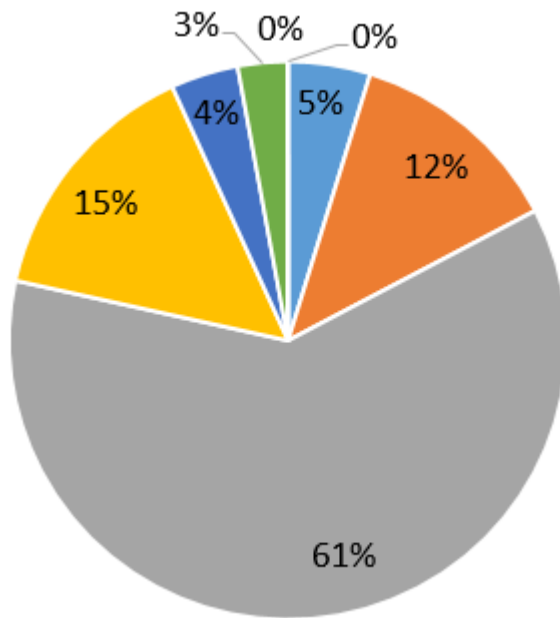
- LSx: <http://www.lsx.org.uk/get-involved/schools/>
- National Clean Air Day: <https://www.cleanairday.org.uk/>
- London Curriculum: <https://www.anewdirection.org.uk/what-we-do/london-curriculum>

# X Primary School

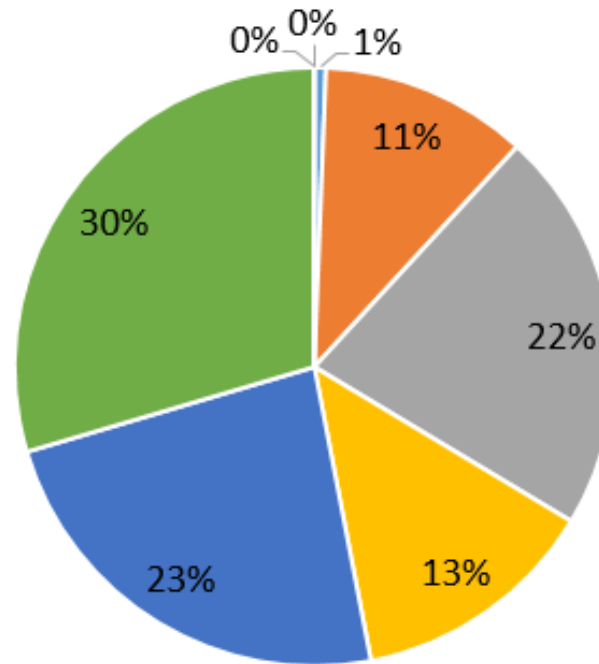


## X Primary School

**Chart 1 - Traffic near the school**



**Chart 2 - Air pollution by traffic near the school**



### Key

- Motorcycle
- Taxi
- Car
- Vans
- Lorries
- Buses & Coaches
- Electric Car
- Electric LGV

Contact [x@london.gov.uk](mailto:x@london.gov.uk) to receive the accompanying PowerPoint slides for your school.



Introduction to air pollution (20-30 minutes)

- Interactive presentation highlighting the issue of poor air quality, the causes, the impacts, and the types of measures that can have a positive impact on reducing poor air quality.
- Suitable for KS1 and KS2, with supplementary points for KS2.
- Use the discussion questions on each slide to encourage the children to volunteer their own ideas.
- Then reveal the answers, see if they got them all, and explain any they may have missed.



KS1/KS2

- It can be hard to describe can't it?
- It is made up of fumes (gas or smoke) and dust in the air.
- Sometimes you can see it or smell it.
- They are made up of gases, and tiny particles too small to see with the human eye.

KS2

- Nitrogen Dioxide (fumes/ gases)
- 'Particulate matter' or PM. The two main types are PM<sub>10</sub> and PM<sub>2.5</sub>.
- Really small particles – you could fit 40 PM<sub>2.5</sub> particles across the width of a human hair.

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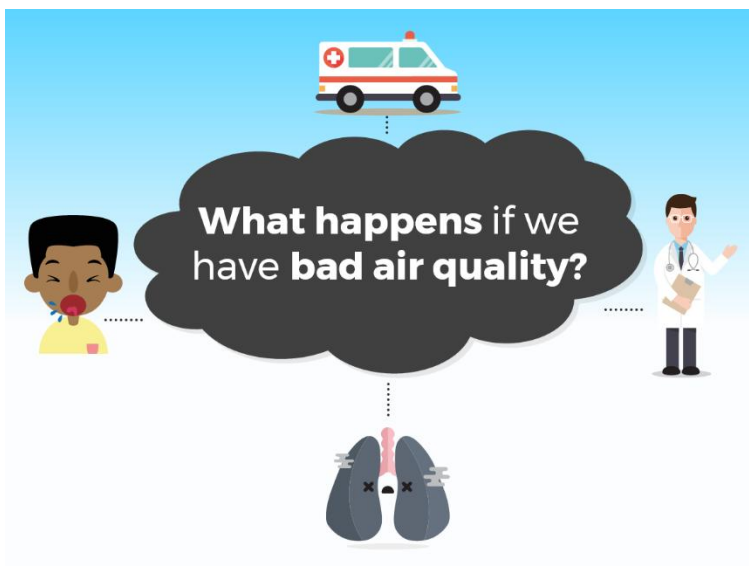


KS1/ KS2

- Factories
- Power stations
- Boilers heating houses, businesses, the school
- Chemicals from cleaning products etc.
- Transport produces a lot of pollution:
  - Cars, Taxis,
  - Lorries, Buses
- Large vehicles like lorries and buses cause a lot of pollution.

KS2

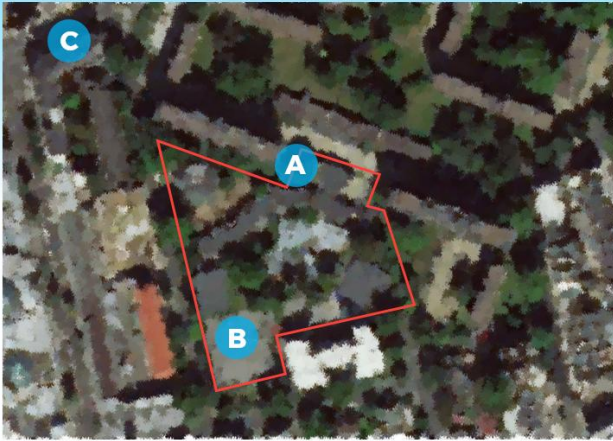
- Diesel vehicles are bad as they produce more Nitrogen Dioxide and Particulate matter'.
- Lorries, buses, and vans and taxis are often diesels.



KS1/ KS2

- Cough
  - Breathing difficulties
  - Asthma – makes it harder for people with asthma to breath
  - Makes us ill
  - May need to see the doctor or go to hospital
- 
- So it's a real problem we need to something about.

Where do you think you are most exposed to poor air quality?



KS1/ KS2

- Can anyone tell me what this image is?
- It's our school – point out features like the playground and main roads to get bearings.
- Based on what we've talked about, and what the causes of air pollution are, which place do you think is most polluted by show of?
  - A
  - B
  - C

KS1/ KS2

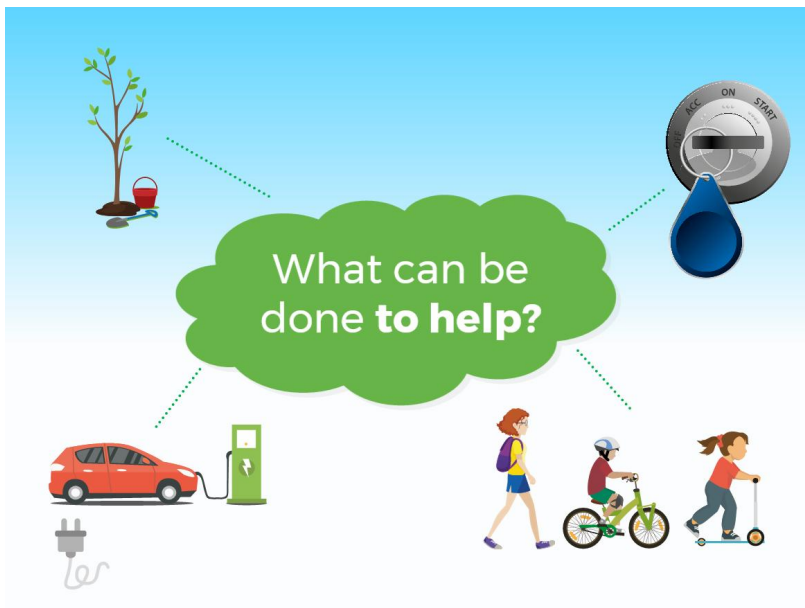
- Explain the bar along the top shows that areas in blue or green are good, areas in yellows/orange/red/purple are more polluted
- Well done to everyone who got it right
- Explain it's because all the traffic on the main roads is a major source of the pollution

How do you travel to school?



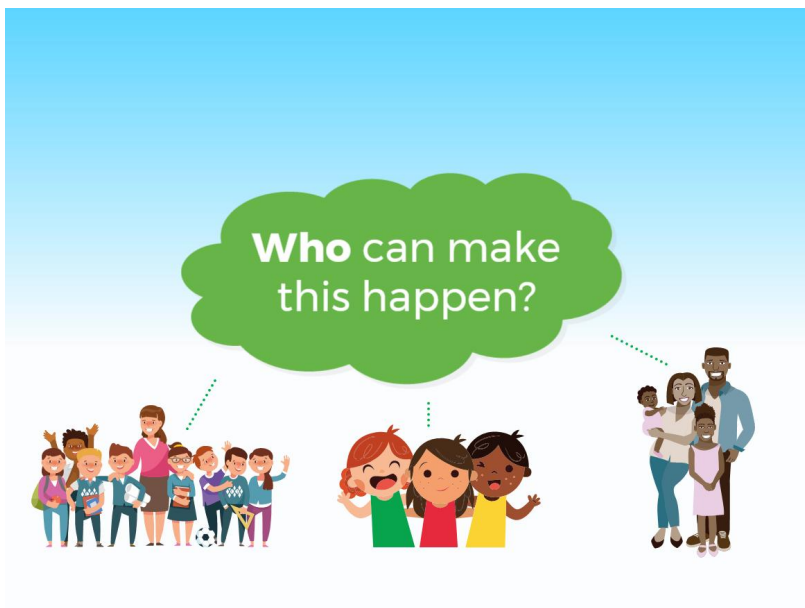
KS1/ KS2

- We've seen what a big part transport plays in air pollution, so let's think about how we travel to school
- Show of hands
- Which is best in terms of air pollution?
- Why?



KS1/ KS2

- Key in the ignition = stopping engine idling (where people leave the engine running when parked).
- More travel by walking, scooting, cycling ...or public transport
- Though we know some people may need to travel by car
- Electric cars
- Planting trees to capture and absorb some pollution (particulates)



KS1/ KS2

- Themselves
- Class mates
- Teachers
- Family
- Wider community
- The Council
- The Mayor
- Transport for London
- The Government
- ....everyone has a part to play

**MAYOR OF LONDON**

# **Appendix D – Toolkit of Measures to Improve Air Quality at Schools**



# The Mayor's School Air Quality Audit Programme

## Air Pollution at Schools

### Toolkit of Measures to Improve Air Quality at Schools

May 2018

**MAYOR OF LONDON**

# Content

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## Introduction

### Developing the Toolkit

This toolkit of measures for addressing air quality issues has been created for use in developing the recommendations for a school. The toolkit will be used as a source of reference in completing school air quality audits.

The toolkit was compiled from a review of best practice approaches and new technologies. It includes well established measures as well as more innovative solutions and quick wins. The range of measures includes hard hitting solutions and contains both physical and behavioural measures.

The toolkit is multi-disciplinary and holistic in its nature, as promoted by the Healthy Streets approach, in seeking to address a broad range of factors which each influence how streets are used, how people travel and consequently how clean the air is in and around schools.

The toolkit provides information which includes:

- Comprehensive set of measures
- Detailed description of measures
- Identification of their scale of impact and benefits
- Precedents of measures, including photos

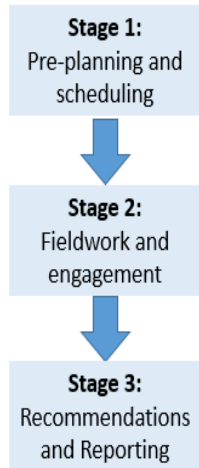
The toolkit of measures and audit templates will serve as a replicable good practice approach, but are also intended to be live documents, to build on our knowledge of how effective different measures prove to be over time, allowing the toolkit to be continually refined for future audits.

### Who is the Toolkit for?

The toolkit can be used by boroughs, schools and other organisations who will be involved in completing school air quality audits. However, a certain level of technical expertise is required to understand what the measures represent and when it is appropriate to use them. The detailed description of the measures has been written on the basis that suitably experienced professionals will be the main audience. The naming of the measures has been kept as simple and concise as possible so that the terms are, as far as possible, easily understood. However, the use of technical terms is unavoidable.

# Applying the Toolkit

## When to use the Toolkit



The audit approach can be considered in terms of the following components:

- Technical Content of Audit.
- Audit day – scheduling, operations, running times.
- Toolkit of Solutions.
- Engagement Activities.

The audit will consist of the three key stages shown opposite, within which there are the following tasks:

1. Air quality assessment and context plan preparation.
2. Fieldwork – complete audit templates with input from the school and borough officers (air quality, school travel, transport planning).
3. Review findings and identify key issues, sources of emissions and causes of exposure.
4. Identify measures from the toolkit to address these issues, informed by the audit findings.
5. Reporting on audit process, issues and recommendations.

The toolkit can be used as a source of reference on the day of the audit as well as in the subsequent development of recommendations and in the reporting. The audit will involve engagement with school representatives and borough officers to discuss issues and opportunities for improving air quality. The toolkit will help in facilitating the discussions and in generating ideas.

## Suitability of Measures

The characteristics of the local area, school site and school building must be carefully considered when identifying and tailoring a suitable package of measures to address the issues identified in causing sources of pollution or exposure to air pollution. These recommendations should also be developed with an appreciation of any relevant existing plans for the local and wider area around the school.

The auditors and stakeholders should be aware of the potential wider benefits of each measure and also how well the package of measures works together. The audit promotes a holistic approach to improving air quality and reducing exposure in the area, such that benefits may also be gained for walking, cycling, public realm and road safety. This is fully accordant with the principles of the healthy streets approach which aims to create more pleasant, safe, attractive, and ultimately more liveable environments.

## Key assessment criteria

The measures and initiatives have been categorised as either highways, school grounds, school building, behaviour change or wider measures, and are assigned an indicative rating against a series of key criteria, including:

- **Potential Air Quality Improvement**
  - Low – nominal measureable change but a tangible reduction in sources or exposure.
  - Medium – a small measurable change in air quality.
  - High – a large measureable improvement in air quality.
- **Wider Benefits**
  - Such as improved safety, visual amenity, child health and welfare, improve learning environments, costs savings, promotion of sustainable transport, contributes to STARS or Healthy Schools London.
- **Cost** (*Note these reflect the overall costs, but these may vary amongst difference stakeholders*).
  - Low - <£10k
  - Medium - £10k-100k
  - High - >100k
- **Deliverability**
  - Quick Win – readily deliverable within 12 months.
  - Medium term – deliverable within 1-3 years.
  - Longer term – only deliverable in the longer term (i.e. over 3 years).
- **Stakeholder Support**
  - Low – likely to be significant objections which could delay/prevent the scheme.
  - Medium – may be some objections and will require consultation but not significant delays.
  - High – likely to be strong support from key stakeholders.

In addition, the toolkit indicates whether the measures:

- Primarily target reducing the source of pollution and/ or reducing exposure.
- May be suitable for introducing as a trial at relatively low cost, within minimal/no consultation for a period of days, weeks or months in order to determine their suitability and impact.
- Are suitable for introduction on a main road and/or minor roads – some measures restrict traffic flow which on main roads may not be suitable, particularly Transport for London roads and the Strategic Road Network.

# Summary of Measures

## Air Pollution at Schools



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# Summary of Measures

1. HIGHWAY MEASURES	
<b>A</b>	<b>Anti-idling</b>
A1	Fines
A2	Campaigns, including driver engagement
A3	Information signage
<b>B</b>	<b>Reducing traffic flow</b>
B1	'School Streets'
B2	Collapsible bollards
B3	'Play Streets' ( <i>temporary measure</i> )
B4	Road closure
B5	Filtered permeability
B6	One-way streets/ No entry restrictions
B7	ULEV-only streets
B8	Width restriction (e.g. 7ft)
B9	Environmental weight limit signs
B10	Reallocate roadspace
B11	Weight restrictions
<b>C</b>	<b>Smoothing traffic flow/speed</b>
C1	Modify traffic calming
C2	Optimise traffic signals
C3	Junction improvements
<b>D</b>	<b>Reducing drop-off activity</b>
D1	Public Space Protection Orders
D2	School Keep Clear markings
D3	Double/single yellow lines
D4	Improve enforcement of restrictions
<b>E</b>	<b>Improved pedestrian and cyclist environment</b>
E1	Improved pedestrian environment - footway widening, kerb build-outs
E2	Improved crossing facilities on desire lines
E3	Traffic calming
E4	Improve Visibility of the School
E5	Cycle hangers
<b>F</b>	<b>Promote a switch to low emission vehicles</b>
F1	Ultra-low Emission Zone (ULEZ) & Low Emission Zone (LEZ)
F2	Comprehensive charging provision for ULEVs

G Parking/loading	
G1	Identify a Park & Stride site
G2	Remove or relocate parking/ loading bays and/or amend restrictions
G3	Introduce kerb blip loading restrictions
G4	Enforce parking restrictions
G5	Additional parking charges for more polluting vehicles
G6	Introduce or amend CPZ restrictions around school to restrict non-residents parking
G7	Parking rationalisations with ULEV car clubs
<b>H</b>	<b>Buses</b>
H1	Bus stop relocation
H2	Low emission buses
<b>I</b>	<b>Freight and Deliveries</b>
I1	Engage with local businesses to reduce freight/ delivery emissions
I2	Promote low emission vehicles for freight and deliveries
I3	Delivery Servicing Plans (DSPs) for new developments
I4	Re-time Borough commercial waste collection
<b>J</b>	<b>Construction</b>
J1	Planning conditions to reduce impacts of freight traffic
J2	Managing the impact of dust and emissions during construction and demolition
J3	Retrospective discussions with already permitted developments to lessen the impacts
J4	Non-Road Mobile Machinery Audit
<b>K</b>	<b>Planning Policy and Strategy</b>
K1	Healthy Streets approach, sustainable transport and roadspace reallocation from vehicular traffic
<b>L</b>	<b>Green Infrastructure</b>
L1	Green screens
L2	Trees, shrubs, planters
L3	Green Gateways
L4	Pocket parks

2. SCHOOL SITE MEASURES	
<b>M</b>	<b>School Grounds</b>
M1	Additional scooter/ cycle parking
M2	Staff car parking
M3	Anti-idling for deliveries
M4	Re-timing for deliveries
M5	Reduce number of deliveries, staff/visitor vehicle trips and/or use more sustainable modes
M6	Relocate pedestrian entrances
M7	Green screens
M8	Trees/ shrubs/ planters
M9	Green spaces
M10	Pupil & staff cycle parking
M11	Reduced waiting times to enter school grounds
M12	Relocate playgrounds and free flow spaces
M13	Co-ordinate start/ finish times with nearby schools
M14	Reconsider playground layouts to reduce exposure
M15	Sheltered waiting areas for parents/ guardians
<b>School Building</b>	
<b>N</b>	<b>School boilers/ heating</b>
N1	Upgrade aging boilers
N2	Install Optimising Compensator Control System for School Boilers
N3	Boiler flues and extraction equipment
N4	Reducing over-heating and tackling heat gain
N5	Replace aging radiators
<b>O</b>	<b>Improve product choice (e.g. cleaning products)</b>
O1	Improve product choice (e.g. cleaning products)
<b>P</b>	<b>Regular service &amp; maintenance of appliances and equipment</b>
P1	Regular service & maintenance of appliances and equipment
<b>Q</b>	<b>Improve school building insulation</b>
Q1	Improve school building insulation
Q2	Upgrade windows
Q3	Replace temporary classrooms with permanent structures
Q4	Green Roofs
<b>R</b>	<b>Ventilation / Air Filtration</b>
R1	Installation of Air Conditioning Units
R2	Introduce Air Filtration Systems
R3	Install HEPA Filters in Air Handling Units
R4	Other air filtration systems - air purifiers
<b>S</b>	<b>Other</b>
S1	Air quality monitoring and information provision eco-monitors and walking route maps.

3. BEHAVIOURAL MEASURES	
T1	Attain improved STARS accreditation status, ultimately Gold status.
T2	Promote cleaner walking routes to school
T3	Promoting Park & Stride
T4	Promoting car sharing
T5	Walking Route Maps / Leaflets
T6	Parent and Public Workshops
T7	Prepare 'Welcome Packs' for new pupils / parents
T8	Deliver Air Quality focused lesson/s to children
T9	Awareness raising session amongst staff
T10	Daily monitoring of London Air website/ app
T11	Add Air Quality to Junior Citizenship Scheme
T12	Anti-idling campaign
T13	Attain an improved Award in Healthy Schools London, ultimately a Gold Award
T14	Awareness raising events amongst the wider community
T15	Cycle training and promotional initiatives
T16	Gamification to promote active travel
T17	Restrict or reduce personal deliveries
T18	CPD supporting teachers subject knowledge on air quality
T19	Walking Buses

4. WIDER MEASURES	
U1	Targeted scrappage scheme for polluting vehicles entering London
U2	Reform Vehicle Excise Duty
U3	Promote a transition to electric heating and heat pumps
U4	Reform Buildings Regulations to promote heat pumps
U5	Zero emission zones







# Summary of Measures, including Assessment Criteria

## Highway Measures

1. HIGHWAY MEASURES (Key Stakeholder: Borough/ TfL)																			
<b>I</b>	<b>Freight and Deliveries</b>																		
I1	Engage with local businesses to reduce freight/ delivery emissions	X		M	L	M	L	X											Y
I2	Promote low emission vehicles for freight and deliveries	X		M	L	M	L		X										Y
I3	Delivery Servicing Plans (DSPs) for new developments	X		L	L	M	L												Y Y
I4	Re-time Borough commercial waste collection	X		L	M	M	M												Y Y
<b>J</b>	<b>Construction</b>																		
J1	Planning conditions to reduce impacts of freight traffic	X		M	L	M	L		X										Y
J2	Managing the impact of dust and emissions during construction and demolition	X	X	L	L	S	M											X	Y
J3	Retrospective discussions with already permitted developments to lessen the impacts	X		M	L	L	L		X										Y
J4	Non-Road Mobile Machinery Audit	X		L	L	S	M					X							
<b>K</b>	<b>Planning Policy and Strategy</b>																		
K1	Healthy Streets approach, sustainable transport and roadspace reallocation from vehicular traffic	X	X	H	H	L	L		X										Y Y
<b>L</b>	<b>Green Infrastructure</b>																		
L1	Green screens		X	L	L	S	H			X	X								Y Y
L2	Trees, shrubs, planters		X	L	L	S-M	M			X									Y Y
L3	Green Gateways		X	L	L	S	H			X									Y Y
L4	Pocket parks		X	L	M	S-M	H												Y Y



# Summary of Measures, including Assessment Criteria

## School Site Measures: school building

2. SCHOOL SITE MEASURES (Key Stakeholder: School/ Borough)																					
<b>School Building</b>																					
<b>N</b>	<b>School boilers/ heating</b>																				
N1	Upgrade aging boilers	X		L	L-H	S-M	M-H											X			
N2	Install Optimising Compensator Control System for School Boilers	X		L	L	S	H											X			
N3	Boiler flues and extraction equipment		X	L	L	S	M														
N4	Reducing over-heating and tackling heat gain	X		L	L-M	S	H											X	X		
N5	Replace aging radiators	X		L	M	S-M	M											X	X		
<b>O</b>	<b>Improve product choice (e.g. cleaning products)</b>																				
O1	Improve product choice (e.g. cleaning products)	X	X	L	L	S	H														
<b>P</b>	<b>Regular service &amp; maintenance of appliances and equipment</b>																				
P1	Regular service & maintenance of appliances and equipment	X		L	L	S	H														
<b>Q</b>	<b>Improve school building insulation</b>																				
Q1	Improve school building insulation	X		L	L-M	S-M	M-H					X	X	X							
Q2	Upgrade windows		X	L	L-H	S-M	M-H					X	X	X							
Q3	Replace temporary classrooms with permanent structures	X		L	H	M-L	M											X	X		
Q4	Green Roofs		X	L	M	M	M			X			X								
<b>R</b>	<b>Ventilation / Air Filtration</b>																				
R1	Installation of Air Conditioning Units		X	L	L-H	S-M	M-H											X			
R2	Introduce Air Filtration Systems		X	L	M	M	M											X			
R3	Install HEPA Filters in Air Handling Units		X	L	L	S-M	M											X			
R4	Other air filtration systems - air purifiers		X	L	L-M	S-M	M											X			
<b>S</b>	<b>Other</b>																				
S1	Air quality monitoring and information provision eco-monitors and walking route maps.	X	X	L	L	S	H													X	



## Hard Hitting Measures

The combined package of measures that will be developed for schools can have a significant impact on mitigating air quality issues as well as generating some of the wider benefits that are described earlier.

However, some of the measures can be hard hitting in themselves, and some of these are described below:

- **School Streets:** traffic access restrictions at school opening and closing times to help create a safer, more pleasant environment for children travelling to school, by removing air quality and road safety problems associated with through traffic and drop-off activity on the street/s outside the school. The benefits to be gained will be dependent on how much traffic there is at present.
- **Road closures:** A full road closure where possible would remove the associated vehicle emissions and free up space for alternative uses.
- **Bus stop relocation:** In some cases bus stops near the school may serve as a major source of emissions from buses frequently braking and accelerating hard when pulling up to the stop. They may also result in queuing traffic and congestion, and it may be possible to relocate the stop to lessen these issues.
- **Filtered permeability:** The introduction of filtered permeability serves to close a road to motorised vehicles, whilst retaining routes through for pedestrians and cyclists.
- **Ultra-low Emission Zone:** The introduction of the ULEZ in 2019 and the proposed expansion of the ULEZ and tightened emissions standards for the Low Emission Zone will significantly improve air quality. The ULEZ expansion and LEZ proposals are subject to consultation.
- **Low emission buses:** TfL has plans to introduce around 3,000 Ultra Low Emission double-deck buses in central London by 2019 and over 250 Zero Emission single-deck buses into central London by 2020. From 2018, all new double-deck buses entering the TfL fleet will be diesel-hybrid meeting Euro VI emissions standards. TfL is planning to re-fit around 5,000 buses so that they meet the highest emissions standards (Euro VI) as quickly as possible.
- **Wider schemes:** there are a range of potential measures which if introduced can help London take a significant step forward in creating a cleaner city. These include: a targeted scrappage scheme, reform of Vehicle Excise Duty, promoting a transition to electric heating and heat pumps and introducing zero emission zones in central London and town centres and larger inner London and London-wide zones in the longer term.

# Case Studies

## Air Pollution at Schools



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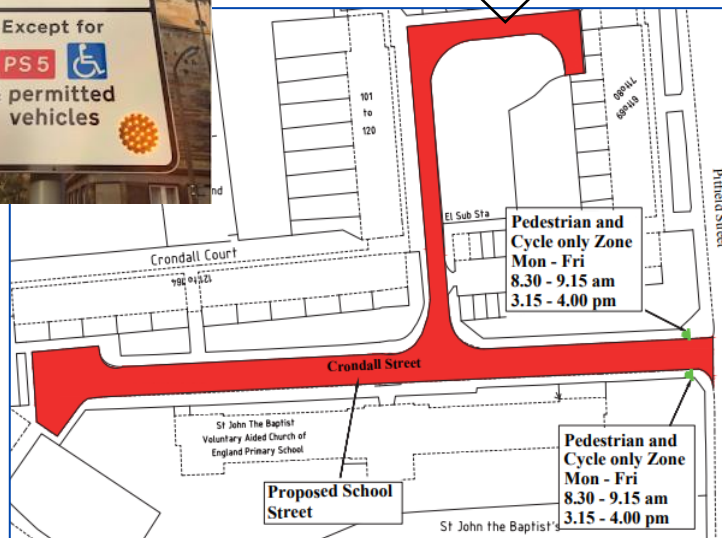
## B1 ‘School Streets’

- Potential Air Quality Improvement = Low
- Cost = Medium
- Deliverability = Medium-term
- Stakeholder support = Medium
- Wider benefits: Road safety
- Suitable for: Minor roads

School Street introduced in Edinburgh - Sciennes Primary School (2015)



LB Hackney is introducing ‘school street zones’ around 5 primary schools as a 9-month trial. Plan for St John the Baptist School shown below



## Description

Traffic access restrictions at school opening and closing times to help create a safer, more pleasant environment for children travelling to school, by removing air quality and road safety problems associated with through traffic and drop-off activity on the street/s outside the school.

## Purpose

- Restrict through traffic and drop-off activity in school peak periods
- Reduces emissions and improves road safety

## Approach

- Introduced as part of Pedestrian Zones or Pedestrian & Cycle Zones
- Use of access signs and ANPR cameras.
- Exemptions for residents, blue badge holder etc through permits
- Issue penalty charge notices for contraventions
- Can use experimental traffic order
- Need to be aware of knock-on impacts on surrounding streets

## Precedents

- Schemes in Scotland running for a few years now
- School streets being introduced in several boroughs, including LB Hackney and LB Croydon



## B3 'School Streets'

- Potential Air Quality Improvement = Low
- Cost = Low
- Deliverability = Short-term
- Stakeholder support = High
- Wider benefits: road safety, sustainable travel
- Suitable for: Minor roads



Hackney schools were the first in the UK to run school hosted play streets. Thomas Fairchild School in Hoxton was the first school to run a play street in 2013.



Source: Hackney Play Association

## Description

'A 'play street' is a timed closure on the street/s outside the school during a certain period of the day (e.g. on Friday after the school day ends). A play street can be run periodically, say once a term. Games and activities are organised for children and parents on the reclaimed street space. Signing and enforcing the closure is a joint exercise between the borough and the school.

## Purpose

- Restrict through traffic and drop-off activity.
- Reclaims the street temporarily so children can play and the school community can socialise.
- Raises awareness of air quality & sustainable travel.

## Approach

- Organisers may be parents or school staff.
- Need to gain support from head teacher and residents/businesses before applying to the council for permission.
- Session typically last between one and three hours. They can take place weekly, monthly, or once a quarter.
- Councils usually provide the 'Road Closed' signage.

## Precedents

- Schemes started in 2013, now commonplace.
- Play streets regularly run in several boroughs, including LB Hackney, LB Islington and LB Camden.

## B5 'Filtered Permeability'

- Potential Air Quality Improvement = Medium
- Cost = Medium
- Deliverability = Medium-term
- Stakeholder support = Low
- Wider benefits: road safety, sustainable travel
- Suitable for: Minor roads



Waltham Forest



Hackney

Haringey



## Description

The introduction of filtered permeability serves to close a road to motorised vehicles, whilst retaining routes through for pedestrians and cyclists. The scope to introduce road closures and filtered permeability measures depends on the wider road network, routing options and the impact of displaced traffic, as well as any requirements for preserving emergency access. Where implemented they can be paired with footway extensions, planting and public realm improvements.

## Purpose

- Reduce volume of through traffic travelling through a residential area.
- Often introduced as part of a range of measures to improve the liveability of a neighbourhood.

## Approach

- Restrict access at a point or through a section of street.
- Maintains access for cyclists and pedestrians.
- Can use bollards, planters or build-out the footway across the road.
- Needs area-wide approach to consider permeability so traffic not just displaced to nearby roads.

## Precedents

- Waltham Forest Mini-Holland 'villages', 2016
- Schemes introduced in LB Hackney, LB Haringey
- Some measures introduced as part of Quietways

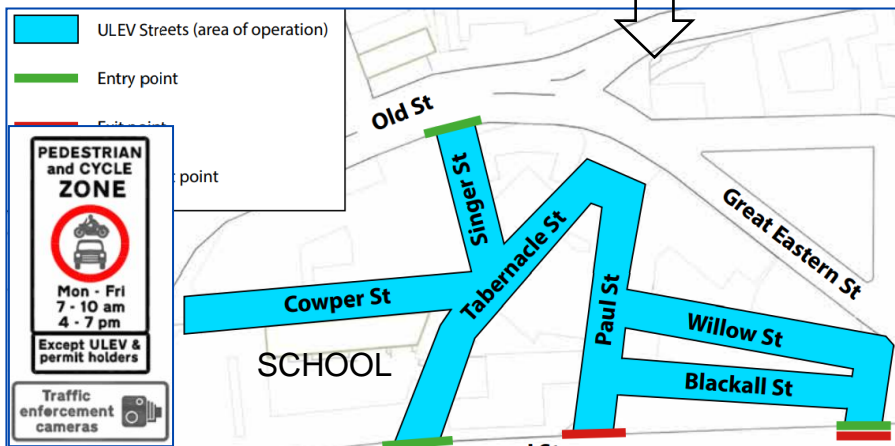
# Highway Measures – ULEV Only Streets (B7)

## B7 'ULEV-only street'

- Potential Air Quality Improvement = Medium
- Cost = Medium
- Deliverability = Medium-term
- Stakeholder support = Low
- Wider benefits: promoting sustainable travel
- Suitable for: Minor roads

Camden – 23 schools will benefit from a 'School Low Emission Neighbourhood' in the Froggnal and Fitzjohns area. The proposal will see 8,500 pupils at 23 schools benefit from streets in the vicinity being restricted to electric vehicles and local access only.

LB Hackney & LB Islington are introducing London's first ULEV-only streets in Shoreditch. One of the streets runs alongside a school. The ULEV-only zones will operate 7am-10am and 4pm-7pm Monday to Friday



## Description

Ultra-low emission vehicle (ULEV) only restriction, utilising a recently approved exemption for ULEVs paired with access restrictions such as Pedestrian Zone, No Motor Vehicles or Bus Lane to promote ULEV uptake and significantly reduce traffic emissions. Like School Streets, ULEV-only streets can have exemptions for permits holders such as residents, businesses and blue badge holders.

## Purpose

- Restrict through traffic and drop-off activity but also promotes use of ULEVs.
- Reduces emissions and improves road safety.
- Can introduce in streets with high footfall/cycling where current exposure to emissions is high.

## Approach

- Restrict access at entry cordon points to the ULEV only streets.
- Use Pedestrian Zone/ Pedestrian & Cycle Zone or No Motor Vehicle signs, with exemptions for ULEVs and permit holders.
- Restrictions during certain times/days or 24/7.
- Use ANPR to enforce restrictions.

## Precedents

- Two areas in Shoreditch: ULEV-only zones in 2018
- Camden: planning ULEV-only streets at 23 schools

## L2 Trees, shrubs, planters

- Potential Air Quality Improvement = Low
- Cost = Low
- Deliverability = Short-Medium term
- Stakeholder support = Medium
- Wider benefits: improved visual amenity
- Suitable for: Major and Minor roads



Trees on carriageway outside school. Provides visual road narrowing and encourages considerate driving behaviour



Trees and planting introduced on footway buildout outside school in Waltham Forest. Narrowed road also deters drop-off activity. Planting area provides sustainable drainage.

## Description

Installation of trees and planting captures some emissions from traffic, thus reducing exposure to children when approaching the school and when within the school grounds/buildings.

## Purpose

- Help to block pollutants but also provide shade, improve the look and feel of the area, and create visual cues to drivers that considerate driving behaviour is appropriate around the school environs.
- Can act as means of sustainable drainage.

## Approach

- Planting and trees on the footway or buildouts immediately outside the school, around the school boundary or on key walking routes to school.
- If to be introduced on footways then care should be taken that adequate width will remain.
- Careful planning is required for the introduction of trees to ensure that the right species are used to maximise exposure reduction benefits, retain sightlines, provide shade, minimise maintenance etc. If used in the wrong location then trees can block airflow and therefore trap pollution.

## Precedents

- Boroughs and TfL have programmes of tree planting .
- Mayor's Greener City fund provides grants for tree planting.

## M7 Green screens

- Potential Air Quality Improvement = Low
- Cost = Medium
- Deliverability = Medium-term
- Stakeholder support = Medium
- Wider benefits: visual amenity, security/privacy, noise reduction, biodiversity



At Sir John Cass School 45m2 of green ivy screens were installed in the playground and roof garden and pupils planted 170 air quality plants. Six mobile green ivy screens with chalkboards were delivered to create unique play areas.

Screens alongside perimeter fence

Movable green screens



## Description

Exposure to roadside pollutants can be reduced through using green screening. Certain types of plants can trap airborne particles and act as a pollution sink.

## Purpose

- Traps airborne particles.
- Green screens provide aesthetic benefits as well as increased privacy, biodiversity and noise reduction.

## Approach

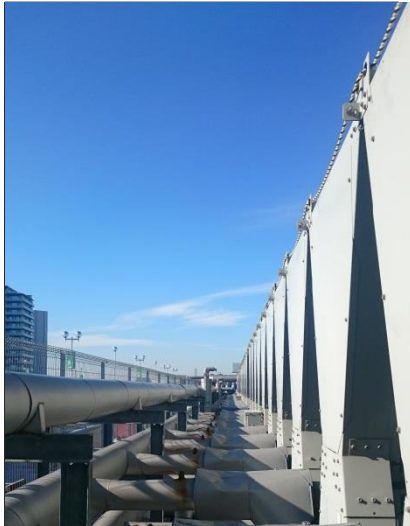
- Green screens can be installed or grown along fences and other barriers/structures. Can also be installed on movable planters.
- The screens can be planted directly into the ground or into planters and are maintained with the option of a drip line irrigation system.
- It should be noted that green screens need ongoing maintenance which has associated time/cost considerations which need to be borne in mind.
- The most effective types are generally those with a dense vegetation layer and a high leaf density, and/or waxy leaves (such as ivy).
- Benefits will be heavily dependant on proximity to the pollution source and school, and screen height and orientation to prevailing wind or wind circulation.

## Precedents

- Precedents: Bowes Primary (Enfield), Oxford Gardens (RBKC) and Sir John Cass (City of London)

## N1 Boiler upgrades and heat pumps

- Potential Air Quality Improvement = Low
- Cost = Low-high
- Deliverability = Short-Medium term
- Stakeholder support = Medium-High
- Wider benefits: reduced operating costs



Heat pump condenser units (centralised & stand alone)



Aging gas fired boiler

## Description

Consider replacing older boilers which are less efficient and contribute to worsening air quality. Where possible replace with Heat Pumps.

## Purpose

- Reduces or eliminates a source of local emissions. Older boiler emissions rise as combustion efficiency drops.
- Improved provision of heating (& potentially cooling).

## Approach

- Where possible replace with Heat Pumps with zero local emissions, particularly where more significant building changes are planned.
- Whilst there are significantly higher costs to install and require remedial works, they will reduce ongoing costs and greatly reduce emissions, increasingly so as electricity generation becomes increasingly decarbonised.
- If direct replacement is required, consider replacing with an Ultra Low NOx gas boiler with dry NOx emissions not exceeding 40 mg/kWh (at 0% O2).

## Precedents

- Brandlehow Primary School, Putney
- King Edward VII High School, Kings Lynn

## R2 Air Filtrations Systems

- Potential Air Quality Improvement = Low
- Cost = Medium
- Deliverability = Medium-term
- Stakeholder support = High
- Wider benefits: reduced operating costs

Example of classroom air filtration system – floor mounted, stand alone system.



Research has shown that the drop in attention from high CO2 is of similar magnitude to that observed when students skip breakfast.



## Description

Consider investing in air filtration systems in classrooms most exposed to poor air quality and reliant on natural ventilation. These systems are relatively high cost, only cover a single room per unit, and require ongoing maintenance and power consumption, but have demonstrated some encouraging initial scientific evidence of efficacy, with titanium dioxide proven to act as a reducer for NOx and NO2, and some claims it will eliminate 99.5% of NO2. They can also assist with virus reduction and PM reduction.

An air filtration system will not reduce CO2 levels. High CO2 can result in reduced attention and therefore learning, so some fresh air is going to be needed through windows, vents or air handling unit.

## Purpose

- Reduces NOx and NO2 levels in classroom.

## Approach

- For classrooms with poorest air quality or high exposure, consider installation of these units.

## Precedents

- Limited use in UK so far – some recent testing carried out in three London schools (results TBC).
- Widely used in South Korea.

# Appendix A – Detailed Description of Measures

## Air Pollution at Schools



**MAYOR OF LONDON**



# Detailed description of potential measures

## Highway Measures

Toolkit Measures	Description	Purpose		Potential Air Quality Improvement	Wider Benefits										Cost	Deliverability	Stakeholder Support	Suitable for trial	Suitability		
		Reduce Sources	Reduce Exposure		Road safety	Promotion of sustainable transport	Visual amenity	Security/privacy	Noise reduction	Biodiversity	Improved learning environment	Reduced operating costs	Awareness raising	Support STARS and IJSL objectives					Main roads	Minor Roads	
<b>1. HIGHWAY MEASURES (Key Stakeholder: Borough/ TfL)</b>																					
<b>A</b>	<b>Anti-idling</b>																				
A1	Fines	Adopt legislation that will allow the borough to fine idling drivers near schools, and ensure the measures are enforced, delivered as part of wider campaign to raise awareness in the first instance, resorting to fines for persistent offenders.	X		L										X	L	L	H	Y	Y	Y
A2	Campaigns, including driver engagement	Initiate a campaign, such as Westminster's #DontBeldie campaign, and look to deploying some of the local volunteers to act as 'Vehicle Idling Action Champions' to raise awareness of the impacts idling can have and benefits of turning off your engine.	X		L										X	L	L	H	Y	Y	Y
A3	Information signage	Signage at the front of the school to raise awareness, accompanied by banner to further promote anti-idling (in a number of languages if required).	X		L										X	L	L	H	Y	Y	Y
<b>B</b>	<b>Reducing traffic flow</b>																				
B1	'School Streets'	Traffic access restrictions at school opening and closing times to help create a safer, more pleasant environment for children travelling to school, by removing air quality and road safety problems associated with through traffic and drop-off activity on the street/s outside the school. Signs will inform drivers of the restrictions. Non-registered vehicles entering the street during the times of operation will be identified by camera and issued a fixed penalty notice. Existing residents would be exempt from any penalties. The impacts of displaced traffic need to be carefully considered, and whether it would result in more 'park and stride' journeys to school, a switch to public transport, or just displace the activity to a different nearby street.	X		L	X										M	M	M	Y		Y
B2	Collapsible bollards	As an alternative to the 'School Street' measure, a collapsible bollard or bollards can be used to prevent vehicle access through the street/s outside the school over specified periods. This could be manually operated by a member of staff if granted the necessary permission by the borough, allowing continued access to the school and nearby homes for those who need it. This measure has been successful at a number of schools, including St Joseph's Catholic Primary School in Camden.	X		L	X										L	M	M	Y		Y
B3	'Play Streets' (temporary measure)	A 'play street' is effectively a timed closure on the street/s outside the school during a certain period of the day (e.g. on Friday after the school day ends). The play street can be run periodically, say once a term. Games and activities are organised for children and parents on the reclaimed street space. Signing and enforcing the closure is a joint exercise between the Borough and the school. 'Play streets' involve quite a lot of organisation and it is best if a local resident or parent is closely involved in the process who can rally others to the cause.	X		L	X	X							X	L	S	H	Y		Y	
B4	Road closure	A full road closure where possible would remove the associated vehicle emissions and free up space for alternative uses. Traffic surveys would need to be undertaken to understand typical traffic flows and potential impacts on surrounding streets. Operational and emergency access requirements would also need to be considered.	X	X	H											L-M	S-M	L-M	Y		Y
B5	Filtered permeability	The introduction of filtered permeability served to close a road to motorised vehicles, whilst retaining routes through for pedestrians and cyclists. The scope to introduce road closures and filtered permeability measures depends on the wider road network, routing options and the impact of displaced traffic, as well as any requirements for preserving emergency access. Where implemented they can be paired with footway extensions, planting and public realm improvements.	X		M	X	X									M	M	L	Y		Y
B6	One-way streets/ No entry restrictions	Investigate options for restricting a road to one-way operation or retain two-way with a No Entry point access restriction. This will reduce traffic flows past the school, which could also enable the footway space to be widened, potentially incorporating trees and shrubs. All of which contribute towards TfL's Healthy Street agenda. Traffic surveys would need to be undertaken to understand typical traffic flows and potential impact on surrounding streets.	X		M	X	X									L-H	S-M	M	Y		Y
B7	ULEV-only streets	Introduce an ultra-low emission vehicle (ULEV) only restriction, utilising a recently approved exemption for ULEVs paired with access restrictions such as Pedestrian Zone, No Motor Vehicles or Bus Lane to promote ULEV uptake and significantly reduce traffic emissions. Like School Streets, ULEV-only streets can have exemptions for permits holders such as residents, businesses and blue badge holders. LB Hackney & LB Islington are introducing London's first ULEV-only streets in Shoreditch. One of the streets runs alongside a school.	X		M		X									M	M	L	Y		Y
B8	Width restriction (e.g. 7ft)	The introduction of a width restriction will mean that certain larger (often more polluting) vehicles will have to use alternative routes. The location of the narrowing would need to be considered carefully as it is likely to create some bunching of vehicles which may increase emissions at this point.	X		L											L	S	M			Y
B9	Environmental weight limit signs	These weight limits prevent large vehicles from using inappropriate roads, routes and areas in order to: reduce emissions, prevent damage to buildings, preserve the character, amenity and environment of an area.	X		L											L	S	M			Y
B10	Reallocate roadspace	Investigate the scope for reallocating some roadspace currently open to all vehicles to promote a wider shift towards more sustainable modes, for example through introducing a new segregated cycle route or bus lane to improve public transport provision and discourage travel by car to reduce local emissions. The likely resulting impact on traffic congestion would need to be considered.	X		M		X									H	L	M		Y	Y
B11	Weight restrictions	Introduce a weight restriction to prevent large freight vehicles routing past a school to reduce local traffic emissions and road safety issues. Alternative more suitable routes would need to be available and the impacts of re-routing would need to be considered carefully.	X		M	X										L	M	M			Y

Case studies







# Detailed description of potential measures

## School Site Measures: school grounds

Toolkit Measures	Description	Purpose		Potential Air Quality Improvement	Wider Benefits								Cost	Deliverability	Stakeholder Support	Suitable for trial	Suitability	
		Reduce Sources	Reduce Exposure		Road safety	Promotion of sustainable transport	Visual amenity	Security, privacy	Noise reduction	Biodiversity	Improved learning environment	Reduced operating costs					Awareness raising	Support STARS and HSL objectives
<b>2. SCHOOL SITE MEASURES (Key Stakeholder: School/ Borough)</b>																		
<b>M</b>	<b>School Grounds</b>																	
M1	Additional scooter/ cycle parking	Increase scooter and cycle parking spaces to encourage sustainable / healthy travel behaviour, particularly near the main entrance. Restricted space means opportunities to provide this outside the school grounds should be explored, such as lockable cycle hangers.	X	L	X							X	L	S	H			
M2	Reduce staff car parking	Consider options to reduce the number of staff travelling to / from school by private vehicle, through promoting and prioritising spaces for car sharing and low emission vehicles. This needs to be balanced with potential staff retention / recruitment impacts.	X	L	X								L	M	L			
M3	Anti-idling for deliveries	Raise awareness with delivery drivers/companies of the detrimental impacts of idling activity.	X	L									L	S	H			
M4	Re-timing for deliveries	Re-time deliveries to not coincide with arrival or pick up times.	X	L	X								L	S	M			
M5	Reduce number of deliveries, staff/visitor vehicle trips and/or use more sustainable modes	Reduce number of deliveries through better stock management, encouraging home delivery etc. Use suppliers who promote use of low emission vehicles, possibility through a borough procurement framework. Explore opportunities for school related deliveries to be undertaken via cycle freight. This could be in collaboration with other neighbouring schools	X	L	X								L	M	M			
M6	Relocate pedestrian entrances	Create or re-open a pedestrian entrance away from more polluted areas, especially if children are often likely to congregate outside the school gates for extended periods whilst waiting to enter.		X	L								L	S	M			
M7	Green screens	Exposure to roadside pollutants can be reduced through the introduction of green screening. Certain types of plants can help trap airborne particles and act as a pollution sink. The most effective types are generally those with a dense vegetation layer and a high leaf density, and/or waxy leaves (such as ivy). Recent research has shown that green screening such as ivy can reduce exposure by over 20%. The benefits from green screens will be heavily depending on their proximity to the pollution source and school location, as well as the screen height and orientation to the prevailing wind or wind circulation. Green screen provide aesthetic benefits as well as increased privacy, biodiversity and noise reduction. Green screens can be installed or grown along fences and other barriers/structures. The screens can be planted directly into the ground or into planters and are maintained with the option of a drip line irrigation system. It should be noted that green screens need ongoing maintenance which has associated time/cost considerations which need to be borne in mind. There are many precedents of green screening at primary schools in London, including Bowes Primary School (Enfield), Oxford Gardens School (Kensington & Chelsea) and Sir John Cass School (City of London).		X	L			X	X				M	M	M			
M8	Trees, shrubs, planters	Install trees and planting to capture some emissions from traffic, thus reducing exposure to children within the school grounds/buildings. Trees and planting can be provided inside the school boundary.																
M9	Green spaces	Introduce additional green spaces within the school grounds for use at play time and as part of educational programmes, including initiatives such as edible gardens.		X	L					X			L-M	M	H			
M10	Pupil & staff cycle parking	Provide additional covered cycle parking spaces to encourage sustainable / healthy travel behaviour	X	L	X							X	L	S	H			
M11	Reduce waiting times to enter school grounds	Explore options for being able to let children into the playground or other areas set back/ screened from areas of poor air quality soon upon arrival, rather than waiting outside the gates if this results in exposure to emissions. This will require additional staff time to supervise the playground.	X	L	X								L	S	H	Y		
M12	Relocate playgrounds and free-flow spaces	Relocate playgrounds and free-flow spaces to less polluted areas of the school grounds where practical. Consider the potential for making greater use of areas more sheltered from traffic emissions, or potentially just on alert days where pollution is especially high. Operationally the school would need to be able to manage and supervise the space and movements of children to and from the area for it to be workable.		X	M			X	X				M-H	M	M			
M13	Co-ordinate start/ finish times with nearby schools	Engage with nearby schools/nurseries and consider the scope for staggering start/ finish times to lessen congestion and associated emissions.	X	X	L	X							L	S	L			
M14	Reconsider playground layouts to reduce exposure	In some cases it may be appropriate to discourage regular use of more heavily polluted areas of the school grounds, and re-purpose the area for use by facilities such as scooter / cycle parking or storage, which could be re-located to these areas if it will in turn free up less polluted but equally usable play space elsewhere.		X	L								L	S	M			
M15	Sheltered waiting areas for parents/ guardians	Provide a sheltered area for parents to wait in that is dry to encourage them not to wait in car with the engine running, and to walk, scoot or cycle instead. A simple, low-cost structure would suffice to act as a wet weather shelter for parents and pupils to wait under during drop-off and pick-up periods This structure could also be used for other purposes by the school.	X	X	L	X							L	S	M			

Case studies





# Detailed description of potential measures

## Wider Measures

Toolkit Measures	Description	Purpose		Potential Air Quality Improvement	Wider Benefits										Suitability						
		Reduce Sources	Reduce Exposure		Road safety	Promotion of sustainable transport	Visual amenity	Security, privacy	Noise reduction	Biodiversity	Improved learning environment	Reduced operating costs	Awareness raising	Support STARS and HSL objectives	Cost	Deliverability	Stakeholder Support	Suitable for trial	Main roads	Minor Roads	
<b>4. WIDER MEASURES (Key Stakeholder: Borough/ TfL/ GLA/ Central Government)</b>																					
U1	Targeted scrappage scheme for polluting vehicles entering London	Engage with any future proposals or consultations regarding the introduction of a targeted scrappage scheme, aimed at more polluting vehicles recorded entering London regularly over an extended period, promoting a transition to ultra-low emission vehicles, in conjunction with measures to promote more sustainable transport.	X		H												H	L	L		
U2	Reform Vehicle Excise Duty	Lobby national government to reform Vehicle Excise Duty to reflect emissions of local pollutants as well as CO2, and remove the ongoing incentivisation this lends to diesel vehicles.	X		H												M	L	L		
U3	Promote a transition to electric heating and heat pumps	Seek to promote the principles of 'an all-electric city', including reducing/eliminating the use of gas in buildings, which city wide account for over 33% of emissions, by requiring or incentivising the use of electric heating/cooling via heat pumps in new buildings and major redevelopments.	X		H												M	L	L		
U4	Reform Buildings Regulations to promote heat pumps	Support and promote dialogue at a national level concerning buildings regulations and how they're calculated to better account for local air quality issues as well as energy efficiency, and so promote wider deployment of technologies such as heat pumps.	X		M												M	L	L		
U5	Zero emission zones	Review the effectiveness of planned measures and develop an approach for introducing a zero emission zone in central London and town centres in the short to medium term, and larger inner London and London-wide zones in the longer term. To be developed in conjunction with other policies such as the creation of Liveable Neighbourhoods, reducing road danger and making more efficient use of the street network, including for freight and servicing. Any specific schemes would be subject to statutory consultation.	X	X	H												H	L	L		