The Mayor of London's Nursery Air Quality Audit Programme

Somerset Nursery School and Children's Centre, London Borough of Wandsworth

FEBRUARY 2020

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THE MAYOR'S NURSERY AIR QUALITY AUDIT PROGRAMME

Somerset Nursery School and Children's Centre – London Borough of Wandsworth

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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 nursery.

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NON-TECHNICAL EXECUTIVE SUMMARY

Long-term exposure to poor air quality contributes to thousands of premature deaths in London. The Mayor wants London to have the best air quality of any major world city by 2050. Young children are amongst the most vulnerable to air pollution's effects. Toxic air can stunt their growth, causing significant health problems in later life.

In May 2018, the Mayor launched a programme of air quality audits to help clean up toxic air and protect the health of young children in 20 nurseries in some of London's most polluted areas.

The **Air Quality Audit** followed a structured approach, with desktop research and air quality modelling, followed by fieldwork and air quality monitoring. Recommendations were then developed based on the consultations with nursery staff and borough officers.

The audit has assessed both outdoor and indoor air pollution levels.

Outdoor pollutants are generated by industrial processes and traffic emissions, and can migrate indoors through windows, doors and other means of ventilation.

Indoor air pollution arises from a mixture of pollutants generated inside a building including building materials and furnishings, and through activities such as cooking, heating, smoking and use of paints, varnishes, cleaning products and air fresheners.

Indoor air pollution is still a relatively new area of study, and our understanding is still evolving as further evidence is collected on the complex interactions taking place, and the extent to which they affect our health.

Audit Findings

Nitrogen oxides (NO$_x$) - Short-term exposure to concentrations of NO$_2$ can cause inflammation of the airways, increasing susceptibility to respiratory infections and to allergens.

The results of the three-month baseline monitoring showed that NO$_2$ concentrations were highest at the **roadside** (40μg/m³), with local road traffic emissions contributing significantly to roadside concentrations.

The three months of baseline NO$_2$ monitoring provides a snap-shot of concentrations in and around the nursery across the winter and spring months. In each month, the measured NO$_2$ concentrations did not exceed the annual mean NO$_2$ national Air Quality Objective (AQO) of 40μg/m³.

These emissions become increasingly dispersed away from the roadside, and fall to 31μg/m³ in the playground, which is partially screened from traffic by fencing and some trees and shrubs.

Concentrations at the nursery entrance are of a slightly higher level (34µg/m³) to the playground. Inside the nursery, the **indoor** concentrations fall by 14-23µg/m^3 compared to external concentrations. Whilst concentrations were found to be below national legal limits, known as Air Quality Objectives, there is no 'safe' level and children would still benefit from further reductions. Children will also be adversely affected by their journeys to and from nursery.

Volatile Organic Compounds (VOCs) are emitted from vapours arising from petrol and solvents. In a nursery setting these are likely to originate from a wide variety of products, including furnishing, carpets, upholstery, cleaning products and air fresheners. In the UK, building regulations recommend total Volatile Organic Compounds (TVOCs) concentrations should be below 300 µg/m^3. In the nursery they were found to be 73.5 µg/m^3. The majority of VOCs identified were likely to be from the fragrances, perfumes and alcohols in, cleaning materials and solvents.

> Overall the monitoring found that indoor air quality at the nursery met legal standards, however there are no entirely safe levels of exposure to harmful pollutants, and the children would still benefit from further reductions.

Formaldehyde are emitted from vapours arising from solvents and adhesives. In a nursery setting these are likely to originate from glues, adhesives and finishing's. Exposure can cause burning sensations of the eyes, nose, and throat, coughing, wheezing, nausea and skin irritation. The World Health Organisation (WHO) indoor air quality guideline for short and long-term exposures to formaldehyde is 100 µg/m^3. In Somerset they were found to be 10.16 µg/m^3.

The wider area around the nursery was assessed using the London Atmospheric Emissions Inventory (LAEI), which showed that pollution levels reducing with distance, away from the heavily trafficked Westbridge Road. NO_2 concentrations are predicted to be highest along the southern boundary of the nursery, which is closest to the main road.

Particulate Matter (PM_{10} and $PM_{2.5}$)[1] is derived from a wide range of sources, including industrial processes, road traffic, dust and brake and tyre wear. The fine component of PM_{10}, known as $PM_{2.5}$, is formed by combustion and is believed to be the main cause of the harmful effects of particulate matter.

Nearly 50% of NOx emissions in London are from road transport. Larger diesel vehicles in particular are major contributors to local air pollution. Approximately **9,600 vehicles per day travel** within 200m of the nursery. Buses make up only 2% of these vehicle movements, but contribute 12% of the transport related NOx emissions locally. Similarly, HGVs only account for 2.5% of the total traffic but contribute 21% of emissions. Cars account for 47% of emissions.

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[1] PM_{10} is particulate matter with an aerodynamic diameter of less than 10 micrometres (10µm). $PM_{2.5}$ is particulate matter with an aerodynamic diameter of less than 2.5 micrometres (2.5µm).

Key observations – summary of potential issues

- **Battersea Church Road is a relatively congested, mainly with cars and some vans**. High levels of congestion and queuing traffic stretching around the school on unsuitable local roads, which results in engine idling at the northern perimeter of the nursery. This particularly affects the 2-year-old outdoor area and the children's centre.
- **Limited safe crossing opportunities** across Battersea Church Road for parents and children – limits the opportunity to access the school via the path along the River Thames.
- **Limited public transport accessibility** with only one bus route running along Battersea Church Road (westbound only). The nearest station is Clapham Junction which is about a 20-minute walk to the south.
- **Anti-social parking by parents** – some parents parking on the private driveway to drop and pick up children, resulting in complaints from residents. Other parents parking in the permit parking / pay and display bays along Sunbury Lane without a permit or paying for parking.
- **2-year-old playground and children's centre exposed to heavy traffic pollution** – these areas are closest to Battersea Church Road which is the main source of local emissions
- **The classrooms are all reliant on natural ventilation** – results in higher temperature during warmer weather, requiring windows/doors to be opened and so greater exposure.
- **Smaller boiler flue extracts directly onto 2-year-old playground** – exposes children to increased emissions due to the flue being at wall height
- **Limited scooter and buggy parking to encourage children to scoot to school** – the buggy parking is noted to fill up during the summer months, when up to 20 buggies parked at the entrance
- **Limited green plants in the classroom and children's centre**

Audit Recommendations

Based on the preceding desktop research, site audits and stakeholder feedback, a range of **recommended measures and initiatives** have been identified to deliver improvements to air quality, both indoor and outdoor, and reduced exposure to air pollution. See Table 4 for full list of measures. Some of the more key measures were considered to be:

- **Air filtration systems** - The children's centre which is most exposed to traffic along Battersea Church Road should be considered for air filtration systems. In addition, it is noted that the nursery in general is reliant on the windows in the warmer months for ventilation.
- **Green Infrastructure** - It was agreed that one of the key measures that should be progressed is the implementation of a green barrier to better protect the children's centre and the 2-year-old outdoor area most affected by idling traffic along Battersea Church Road.
- **Encourage parents to approach the nursery along less polluted routes** - This could include encouraging parents and children to avoid Battersea Church Road and Westbridge Road where possible. This can have a real impact on short-term exposure and is something that parents can be proactive with.
- **Discourage rat running with traffic calming** - Introduce traffic calming and greater enforcement of existing speed limits on Battersea Church Road, to discourage rat-running and change the character the road to a more residential / local road, fostering a safer environment for pedestrians, and encourage more travel by sustainable modes. This could take the form of build

outs to create single lane priority narrowing and improved crossing opportunities to access the path along the River Thames – which could then be promoted as a cleaner route to school.

Next Steps

In working with the nursery and air quality and transport borough officers to complete the air quality audit, we found there to be a passionate group of individuals, who were enthusiastic about improving local air quality for the children, and the wider community as a whole.

The **borough and nursery should investigate the scope for rapidly delivering key measures** from the recommendations.

To take forward the recommendations, the nursery and borough will need to continue to work closely, building on the relationships already in place. A wide range of **potential funding** sources are identified within the report (See Appendix F), and boroughs and nurseries are encouraged to apply for these where appropriate to maximise the potential for delivering the recommendations.

Each nursery will be given a starter grant of £4,500 by the GLA to help kick-start the implementation of recommendations. The GLA will liaise with the nurseries and boroughs to agree which recommendations the grant will be used for.

Summary of Nursery related recommendations

The full range of recommendations primarily applicable to the nursery, as opposed to highways measures to be delivered by the council or TfL, are as follows. See Table 4 for further details on these measures.

Nursery Grounds

Green Infrastructure
Scooter/ Cycle Parking

Nursery Building

Air Filtration Systems
Add indoor plants
Switch to lower VOC cleaning products

Behavioural Measures

Staff Engagement
Behaviour change
Campaigns to discourage illegal parking
Sign up to the STARS programme
Join Healthy Early Years London

1. INTRODUCTION

1.1. BACKGROUND

1.1.1. Long-term exposure to poor air quality contributes to thousands of premature deaths in London. There is strong scientific evidence of the acute health effects of short-term exposure to very high pollution levels experienced during air pollution episodes.

1.1.2. Tackling air pollution is one of the Mayor of London's top priorities, and he recognises that co-ordinated action is required to reduce exposure, especially amongst the most vulnerable such as young children, whose lungs are still developing.

1.1.3. The London Environment Strategy, published in May 2018, seeks to reduce the number of Londoners whose lives are blighted by poor air quality. The Mayor wants London to have the best air quality of any major world city by 2050, going beyond the legal requirements to protect human health and minimise inequalities. This include commitments to act to improve air quality in and around schools and nurseries and provide enhanced information to Londoners.

Why Nurseries?

1.1.4. The Mayor is particularly concerned about the impacts of poor air quality on vulnerable groups such as children, the elderly and those with pre-existing health conditions such as asthma and cardio-vascular diseases. Young 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. The World Health Organization (WHO) also recognises younger children as being a vulnerable group to air pollution, making nurseries a key consideration in improving air quality.

1.1.5. A study led by Kings College in East London found that primary school children had on average 5% lower lung capacity than those growing up in rural areas. A UNICEF report published in December 2017 highlights the impact of air pollution on the critical growth that occurs in the brain in the first 1,000 days of life, making children exposed to pollution more vulnerable to developmental problems. UNICEF estimate that 17 million children globally are breathing air so toxic it is affecting their brain development. Air pollution exacerbates asthma, which affects 1 in every 11 children in England.

The Mayor's Nurseries Air Quality Audits

1.1.6. In May 2018, the Mayor launched a programme of air quality audits to help clean up toxic air and protect the health of young children in 20 nurseries in some of London's most polluted areas. The nurseries were selected based on assessments of predicted annual mean nitrogen dioxide (NO_2) and particulate matter (PM_{10} and $PM_{2.5}$) levels near the nursery, and in agreement with the respective local authority.

1.1.7. The aim is to establish a robust process and toolkit of measures, which the London boroughs and nursery schools can roll out, so that every nursery that is located in an area of high pollution can benefit from this approach.

1.1.8. This programme builds on the approach founded in the Mayor's School Air Quality Audit Programme completed in March 2018, and the audit reports the Mayor recently commissioned on indoor air quality in London's primary schools, which included the Toolkit of Measures to Improve Air Quality at

Schools.[2] The programme is led and funded by the Greater London Authority (GLA) and the audits were conducted by global engineering consultancy WSP, who have visited each of the nurseries, assessing indoor and outdoor air pollution sources, and how children travel to the nurseries.

1.1.9. Road transport is a major contributor to emissions, and has a significant impact on air quality, accounting for around half of NO_x emissions. Whilst private car use is decreasing, congestion is increasing[3]. Without significant intervention, as the Capital grows rapidly these trends are set to continue.

1.1.10. 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 Ultra Low Emission Zone** (ULEZ) launched in central London on 8 April 2019. It replaced the T-Charge (Toxicity Charge) and means that vehicles that do not meet the strict ULEZ emissions stands are charged to drive in the zone, 24 hours a day, every day of the year. It is expected that the ULEZ will reduce road transport emissions of nitrogen oxides (NO_x) by around 45 per cent in the central London zone.
- **Expanding the ULEZ and tightening the Low Emission Zone (LEZ).** The ULEZ will expand to inner London, up to the North and South Circulars, in October 2021, and emissions standards for heavy vehicles in the London-wide LEZ will be tightened (to Euro 6) in October 2020.
- **Cleaning up London's buses.** The Mayor is transforming London's bus fleet with a retrofit programme covering thousands of buses, and only procuring hybrid or zero emission double decks since 2018.
- **Cleaning up the taxi fleet**. From 2018, TfL has stopped new diesel taxis from being licensed in London and all new taxis need to be zero emission capable. TfL provide financial incentives to enable this switch to cleaner taxis and over 175 rapid charge points have been installed, with many dedicated to the trade.
- **Low emission neighbourhoods –** have been funded across London to pioneer measures to promote the use of low emission vehicles and improve local air quality, including low emission

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[2] https://www.london.gov.uk/sites/default/files/school_aq_audits_-_toolkit_of_measures_dr_v3.3.pdf

[3] London Assembly, London stalling: Reducing traffic congestion in London, January 2017, Transport for London, Travel in London - Report 9 data, 2017

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 an ambitious strategy, with a particular focus on air quality published in 2018, and seeks to address the most urgent environmental challenges facing London, to safeguard its environment over the longer term. This strategy establishes aims for London, which include having the best air quality of any major city, and a zero-carbon city by 2050, with energy efficient buildings, clean transport and clean energy. The Mayor is providing funding through his Greener City Fund to create and improve green spaces and to plant trees.
- **The Draft London Plan -** published in November 2017, places a considerable emphasis on air quality. The aim of policies 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.
- **Healthy Streets Approach** - the Mayor is embedding the 'Healthy Streets' approach in transport strategy. This promotes a holistic approach to improve 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. The Mayor's ambition for 80% of trips in London to be made on foot, by cycle or using public transport by 2041, and a commitment to make the entire transport system zero-emission by 2050.

1.1.11. These measures are already starting to have a measurable impact on pollution levels in London. However, the Mayor also wanted to take early action at 20 nurseries located in areas with some of the highest air pollution levels, so has provided £250k funding to commission this programme.

1.1.12. The Mayor's Nurseries Air Quality Audits Programme follows the approach developed as part of the Mayor's School Air Quality Audit Programme, identifying a combination of hard-hitting measures and quick win improvements, to minimise the impacts of toxic air on nursery 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.

1.2. OBJECTIVES

1.2.1. The key objectives of the Mayor's Nurseries Air Quality Audit Programme are to:

- Audit and identify the sources of poor outdoor air quality and exposure by children at 20 state-funded nurseries and their surrounding nursery catchment areas, including NO_2, PM_{10} and $PM_{2.5}$.
- Audit and identify the sources of poor indoor air quality and potential exposure by children attending the nurseries, and establishing a baseline of indoor air quality.
- Assess the feasibility of installing air filtration systems at the selected nurseries' sites.
- Trial and monitor the effectiveness of air filtration systems in at least 5 of the nurseries sites.
- To identify, evaluate and recommend measures within and around the nurseries' that will help a borough and nursery to reduce particulate matter, emissions and children's exposure to poor air quality, and award grant funding to deliver some of the recommended measures.
- To engage nursery communities and raise awareness about the impacts of air pollution, including an introduction to Transport for London's STARS programme and the GLA's Healthy Early Years London Programme.
- To engage eligible London boroughs and other relevant stakeholders to inform the context and feasibility of the proposed recommendations.

2. AUDIT APPROACH

2.1. OVERALL AUDIT APPROACH

2.1.1.   The Mayor's Nurseries Air Quality Audits follow the structured approach established through the preceding audit programme of Primary Schools, summarised in Figure 1 below.

Figure 1 – Overview of Approach
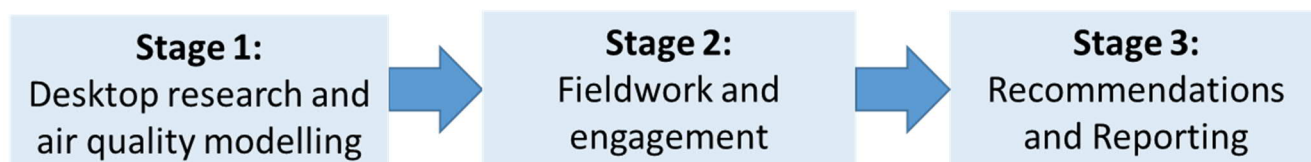
2.1.2.   Each audit consists of broadly three key stages:

Stage 1: Desktop research and air quality modelling

2.1.3.   Prior to the site visit **air quality modelling** was undertaken for the area around the nursery, with an assessment of the contribution to emissions made by each vehicle type on the roads around the nursery.

2.1.4.   A **desktop review** of the local areas around the nursery site, and the wider catchment was also undertaken, to highlight key features for the auditor to assess further on site. This includes sources of pollution, 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 nurseries STARS[6] travel plan progress was also reviewed for reference ahead of the audits.

Stage 2: Fieldwork and consultation

2.1.5.   A site visit to the nursery was undertaken by the WSP auditor and officers at the borough who deal with air quality, transport planning and school/ nursery travel.

2.1.6.   Observations were undertaken with the borough officers and nursery staff during the peak arrival/ departure time, to capture as much information as possible on drop-off and waiting activity in and around the nursery, **identifying external sources of emissions** close to the nursery, and the areas where the children are exposed to poor air quality when approaching the nursery.

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[6] 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.

2.1.7.   The external observations were then followed by an **audit of the building and grounds** which was undertaken with the assistance of the facilities manager, to enable the auditor to familiarise themselves with its layout, and the proximity of classrooms and playgrounds to areas of poor air quality. The audit included a review of the nurseries boilers, and considered features likely to lead to emissions of indoor air pollutants, such as building ventilation, evidence of fresh air intrusion, and identifying use and location of potential pollutant sources.

2.1.8.   A key element of the audits was to capture the views of nursery staff, the wider nursery community, and relevant borough officers, to gain an understanding of operational considerations, behavioural traits and recent history of the nursery.

2.1.9.   A **brainstorming session** was then undertaken, with staff from the nursery 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 could 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 discussed and collected feedback and suggestions from the borough and nursery representatives to inform the recommended measures.

2.1.10.   Nursery staff were also consulted regarding what they felt would be the most suitable and effective form of **engagement activity**, which could be undertaken at the nursery to raise awareness of air pollution, its causes, the health impact, and a range of measures to reduce air pollution.

2.1.11.   A 3-month baseline **air quality survey** was undertaken to monitor Nitrogen Dioxide (NO_2), Formaldehyde and Volatile Organic Compounds (VOCs) at sites both inside and outside the nursery building, in order to capture any attenuating influence the indoor environment may have on NO_2 concentrations.

Stage 3: Recommendations and Reporting

2.1.12.   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. The auditor was also able to draw on an updated version of the toolkit of best practice measures and case study examples, developed for the previous primary school audit programme.

2.2.   AUDIT SCHEDULE – SOMERSET NURSERY SCHOOL

2.2.1.   Table 1 provides further detail of the audit schedule and key participants from the nursery and borough.

Table 1 – Audit Details

Date of Audit	Wednesday 12th December 2018	
Nursery Representatives	Louisa Halls (Headteacher)	
Borough Representatives	Nicoletta Vianello (Air Quality Officer) Deborah Willemen (School Travel Advisor)	
WSP Auditors	Daniel Quan	
Itinerary	**Timings**	**Description**
	0800 - 0830hrs	Initial observations and site familiarisation by WSP auditors
	0830 – 0900hrs	Site walk and observations with borough air quality officers/ school transport officer/ nursery staff
	0900 – 0930hrs	Audit of building and grounds to appreciate the layout of the building/playgrounds etc. accompanied by the bursar/caretaker
	0930 – 1100hrs	Brainstorming Workshop with key staff from the nursery and borough officers.
	1100 – 1200hrs	Further observations and completion of site audit template

3. CONTEXT AND INITIATIVES

3.1. NURSERY CONTEXT

Figure 2 - Nursery Context

Borough: Wandsworth

Address: 157 Battersea Church Rd, SW11 3ND

Pupil Numbers: 80

Age Range:
3-5 years

Gender:
Mixed

Type: Local authority nursery school

Deprivation Rank: 6

Children attending Full Time/ Part Time:

Full Time

Part Time

Children who speak English as an additional language:

Higher than average

Children with disabilities or special educational needs:

Higher than average

3.1.1.   **Somerset Nursery School and Children's Centre** is located in South West London and sits within the Borough of Wandsworth.

3.1.2.   At the time of the audit there were **60 children** in the nursery (3 & 4-year olds), with an additional 24 children enrolled in the 2-year old programme (attend in two groups of 12 children). The children's centre caters for about 80 local families.

3.1.3.   Approximately **9,600 vehicles per day travel** on the core roads within a 200m radius of the nursery[7]. This is within the 3rd quartile in terms of traffic volumes amongst of the 20 nurseries assessed as part of this programme. For context, in the UK in 2017[8] the average traffic flow on urban minor roads was 2,100 vehicles, and 19,200 vehicles on an urban A-road.

3.1.4.   The site audit and subsequent discussions with the nursery confirmed that **most children walk, scooter or use a buggy to get to school.** The school does not currently have trip data, but has expressed an interest to collect mode share data and become part of STARS.

3.1.5.   The subsequent two pages illustrate the context of the nurseries within the local area.

- The **outer context** plan highlights key roads and land uses in the area, including the frequencies of buses, as well as other notable sources of air pollution. The figure also illustrates the key walking routes taken by the children when approach the nursery.
- The **inner context** plan provides detail on the main accesses (both pedestrian and vehicular) to the nursery, and the location of the playgrounds where children are most exposed to air pollution.

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[7] The traffic flows and vehicles splits presented are based on the average number of vehicles on each LAEI modelled road link within 200m radius of the nursery in the LAEI 2013 base.

[8] DfT Road Traffic Estimates: Great Britain 2017 (2018)

Figure 3 – Outer Context Plan

Key

⭐ Somerset Nursery and Children's Centre

🚌 Bus Stop

Bus Route

Cycle Route

🚆 Train Station

Underground Station

Local Centre

Green Space

⛽ Petrol Station

↔ At-grade Pedestrian Crossing

Key Pedestrian routes to school

Pedestrian Access

== Rail

(20) Speed Limit

170 (8/hr one way)

170 (8/hr one way)

170 (8/hr each way)

639; 670 (2/day one way – School Service)

Battersea Church Road

Westbridge Road

Parkham Street

Vicarage Crescent

Contains Ordnance Survey data © Crown copyright and database right 2017.

Figure 4 – Inner Context Plans
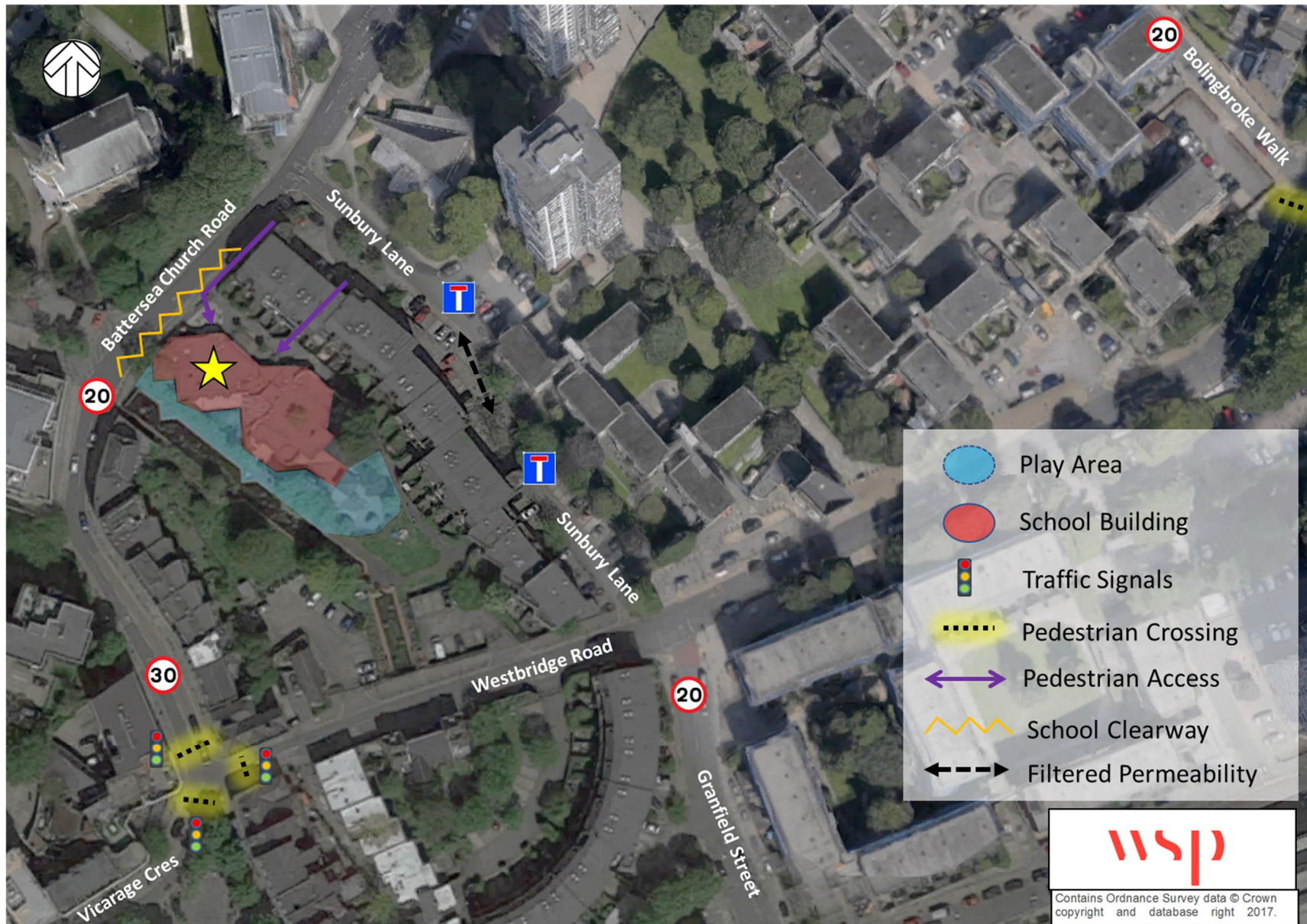
3.2.   PLANNED SCHEMES & RECENT INITIATIVES

3.2.1.   There are no major developments planned or under construction within the immediate locality of the nursery.

WIDER SCHEMES

ULTRA LOW EMISSION ZONE (ULEZ) AND LOW EMISSION ZONE (LEZ)

3.2.2.   The recently launched ULEZ will operate 24 hours a day, 7 days a week within the same area as the current Congestion Charging Zone (CCZ). 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. Further details on emissions standards and classification of vehicles can be found through TfL. The London-wide Low Emission Zone (LEZ) is being tightened to a Euro VI emissions standard for heavy duty vehicles (buses, coaches, Heavy Goods Vehicles (HGVs) from October 2020. The ULEZ will be expanded for light duty vehicles (such as 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 October 2021. It is forecast that an expanded ULEZ and tighter LEZ standards will result in 20 per cent less harmful nitrogen oxide (NOx) from road transport in the borough from 2021.

Impact of scheme:
▪ Reduced air pollution as more polluting vehicles are discouraged from travelling in the ULEZ.

LOCAL SCHEMES

CYCLE SUPER HIGHWAY 8 (CSH8)

3.2.3.   The cycle superhighway route runs between Wandsworth and Westminster, passing south of Somerset Nursery School and Children's Centre along York Road and Battersea Park Road. The route provides a safer, faster and more direct route for cyclists heading between outer London and central London.
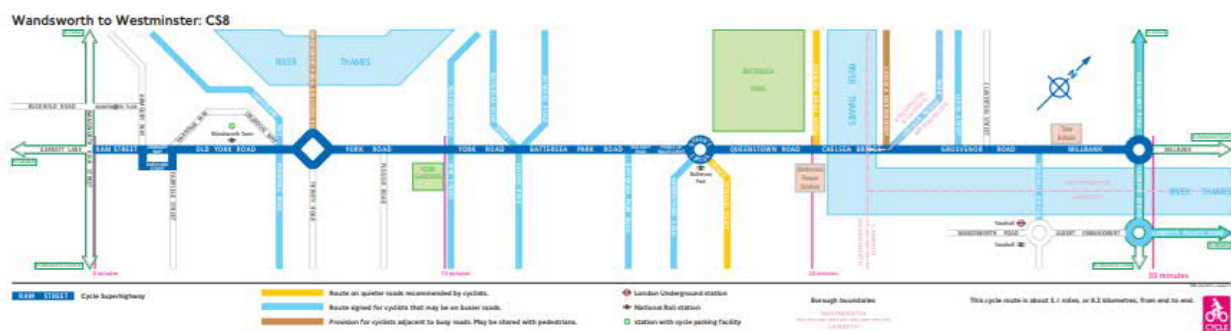
QUIETWAY 8 CYCLE ROUTE – BERMONDSEY TO PECKHAM

3.2.4.   Quietways are part of a London-wide programme to implement a network of continuous and convenient cycle routes on less-busy streets across London. The Clapham Common to Wimbledon (Quietway 4) and Waterloo to Norbury (Quietway 5) are planned to run through the borough.

Impact of scheme:
· Improved travel options locally via sustainable travel (walking and cycling).

4. AIR QUALITY AUDIT FINDINGS

4.1.1. The air quality audit findings are summarised in this chapter as follows:

- Baseline air quality; and
- Observed issues, emission sources and potential exposure

4.1. BASELINE AIR QUALITY

4.1.1. The air quality audit used a combination of modelled and measured data to establish the local, baseline pollution levels in and around each nursery.

4.1.2. Three pollutants were monitored in and around the nursery, these were **nitrogen dioxide (NO$_2$)**, **formaldehyde (CH$_2$O)** and **Volatile Organic Compounds (VOCs)**. All three pollutants can cause respiratory inflammation which can exacerbate to respiratory problems such as asthma and bronchitis at high levels.

4.1.3. NO$_2$ is both a primary and secondary pollutant, derived from emissions of nitrogen oxides (NO$_x$) from combustion sources. In London key sources include road vehicles and domestic boilers. Vehicle emissions contribute significantly to local increases in concentrations especially near busy roads.

4.1.4. VOCs are made up of a range of organic compounds, including formaldehyde. They have a significant photochemical oxidant forming potential and contribute to the formation of secondary pollutants, such as NO$_2$. They arise from a wide variety of products commonly used in homes and workplaces, including furnishing, carpets, upholstery, cleaning products and air fresheners.

4.1.5. Formaldehyde is a notable VOC, and can be released from furniture, finishes and building materials, and is formed in chemical reactions from combustion processes, such as smoking, heating, cooking or candle burning.

4.1.6. Baseline air pollutant monitoring was undertaken for three months. At Somerset Nursery School and Children's Centre, five NO$_2$ diffusion tubes, one formaldehyde diffusion tube and one VOC diffusion tube were deployed in the following locations:

Nitrogen Dioxide (NO$_2$)
- roadside outside the nursery
- immediately outside the nursery entrance
- playground
- immediately inside the nursery entrance
- inside a nursery classroom.

Formaldehyde and VOCs
- Inside a nursery classroom.

4.1.7. See Appendix C for further details on the location of the diffusion tubes.

Figure 5 - Comparison of the average NO$_2$ concentrations at Somerset Nursery School and Children's Centre (µg/m^3)
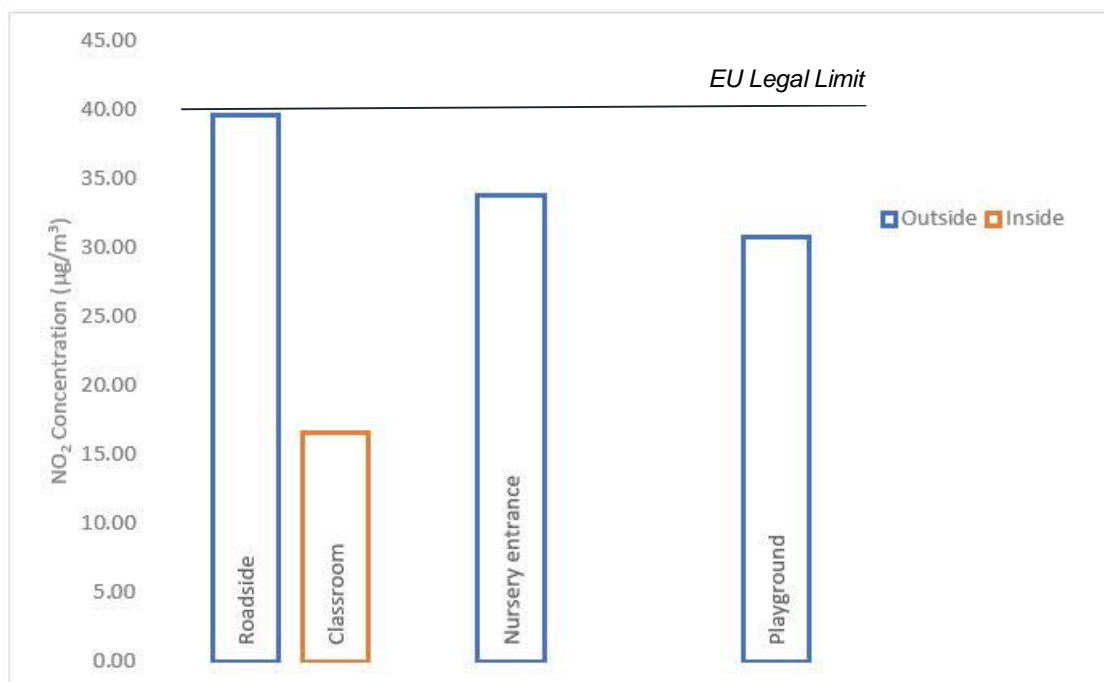
4.1.8.   The results of the three-month baseline NO$_2$ monitoring at Somerset Nursery School and Children's Centre, shown in Table 2.

Table 2 – Somerset Nursery School and Children's Centre: Three Month Baseline NO$_2$ Monitoring Results (µg/m^3)

Diffusion Tube Location	Indoor / Outdoor Location	Baseline NO$_2$ Monitoring Results - NO$_2$ (µg/m³)			
		December	January *	February*	Average
Roadside	Outdoor	39.58			39.58
Playground	Outdoor	30.77			30.77
Nursery entrance	Outdoor	33.75			33.75
Nursery entrance	Indoor	-			-
Classroom	Indoor	16.58			16.58
Ratio of indoor to outdoor (I/O) concentrations		0.48			0.48

*Samples not returned

4.1.9. NO_2 concentrations were found to be highest at the **roadside** (39.58µg/m³), with local road traffic emissions contributing significantly to roadside concentrations.

4.1.10.   The three months of baseline NO_2 monitoring provides a snap-shot of concentrations in and around the nursery across the winter and spring months, when concentrations are likely to be at their highest due to elevated NO_x emissions driven by the cold weather.

4.1.11. NO_2 concentrations fall to 31µg/m³ in the **playground**, which is partially screened from traffic by fencing and some trees and shrubs. Concentrations at the **nursery entrance** are of a slightly higher level (34µg/m³) to the playground.

4.1.12.   **Inside the nursery**, concentrations fall by 14-23µg/m³ compared to external concentrations. It should be noted that indoor NO_2 is not regulated against EU limits, it is regulated against HSE exposure limits.

4.1.13.   Previous research undertaken for the GLA found that outdoor NO_2 concentrations and the airtightness of the building envelope explained 84% of the variation between classrooms, indicating the influence of strong outdoor pollution sources and the importance of the building envelope. Overall, indoor to outdoor (I/O) ratios in both seasons ranged from 0.3-0.5 in an airtight, contemporary school compared with 0.7-0.9 in Victorian schools that have original wooden window frames.

4.1.14.   The NO_2 I/O ratio was 0.49 at Somerset Nursery School and Children's Centre, indicating that uncontrolled infiltration rates are at the lower end of the spectrum, and so the building offers a reasonable level of protection to its occupants.

4.1.15.   The results of the three-month baseline VOC and Formaldehyde monitoring are shown in Table 3.

Table 3 – Somerset Nursery School and Children's Centre: Three Month Baseline Formaldehyde and VOC Monitoring Results (µg/m³)

Pollutant	Baseline Formaldehyde and VOC Monitoring (µg/m³)			
	December	January*	February*	Average
VOCs	135.5	-	-	135.5
Formaldehyde	10.16	-	-	10.16

*Samples not returned

4.1.16.   **Volatile Organic Compounds (VOCs)** are emitted from vapours arising from petrol and solvents. In a nursery setting are likely to originate from a wide variety of products, including furnishing, carpets, upholstery, cleaning products and air fresheners. Exposure can cause irritation to the eyes and upper airways. In the UK, building regulations recommend total Volatile Organic Compounds

(TVOCs[9]) concentrations should be below 300 µg/m^3. In Somerset they were found to be 135.5 µg/m^3. Samples were not returned by the Nursery after December. Within the December samples the majority of VOCs detected were chemical species were identified as being likely to be indoor pollutants, and included fragrances, perfumes and alcohols, likely to be products derived from use of cleaning materials and solvents.

4.1.17. **Formaldehyde** are emitted from vapours arising from solvents and adhesives. In a nursery setting these are likely to originate from glues, adhesives and finishing's. Exposure can cause burning sensations of the eyes, nose, and throat, coughing, wheezing, nausea and skin irritation. The World Health Organisation (WHO) indoor air quality guideline[10] for short- and long-term exposures to formaldehyde is 100 µg/m^3. In Somerset they were found to be 10.16 µg/m^3.

4.1.18. In addition to the monitoring undertaken at the site, 2013 baseline annual mean NO$_2$, PM$_{10}$ and PM$_{2.5}$ concentrations have been estimated for each nursery from the **London Atmospheric Emissions Inventory** (LAEI) maps.

4.1.19. Briefly, the LAEI model provides mapped annual mean NO$_x$, NO$_2$, PM$_{10}$ and PM$_{2.5}$ concentrations on a 20m x 20m basis for the whole of London from a base-year of 2013 for 2020, 2025 and 2030.

4.1.20. 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.

4.1.21. Figure 5 shows the 2013 LAEI baseline annual mean NO$_2$ concentrations within the vicinity of Somerset Nursery School and Children's Centre.

4.1.22. The contours (changes in colours) show the change in the change in pollution gradients, with distance, away from the heavily trafficked Westbridge Road. NO$_2$ concentrations are predicted to be highest along the southern boundary of the nursery, which is closest to the main road.

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[9] TVOC is a grouping of a wide range of organic chemical compounds to simplify reporting when these are present in ambient air or emissions.

[10] Chapter 5.8 Formaldehyde. WHO Air Quality Guidelines – Second Edition, 2001

Figure 6 - LAEI Baseline Annual Mean NO₂ Concentrations within the Immediate Area of Somerset Nursery School and Children's Centre
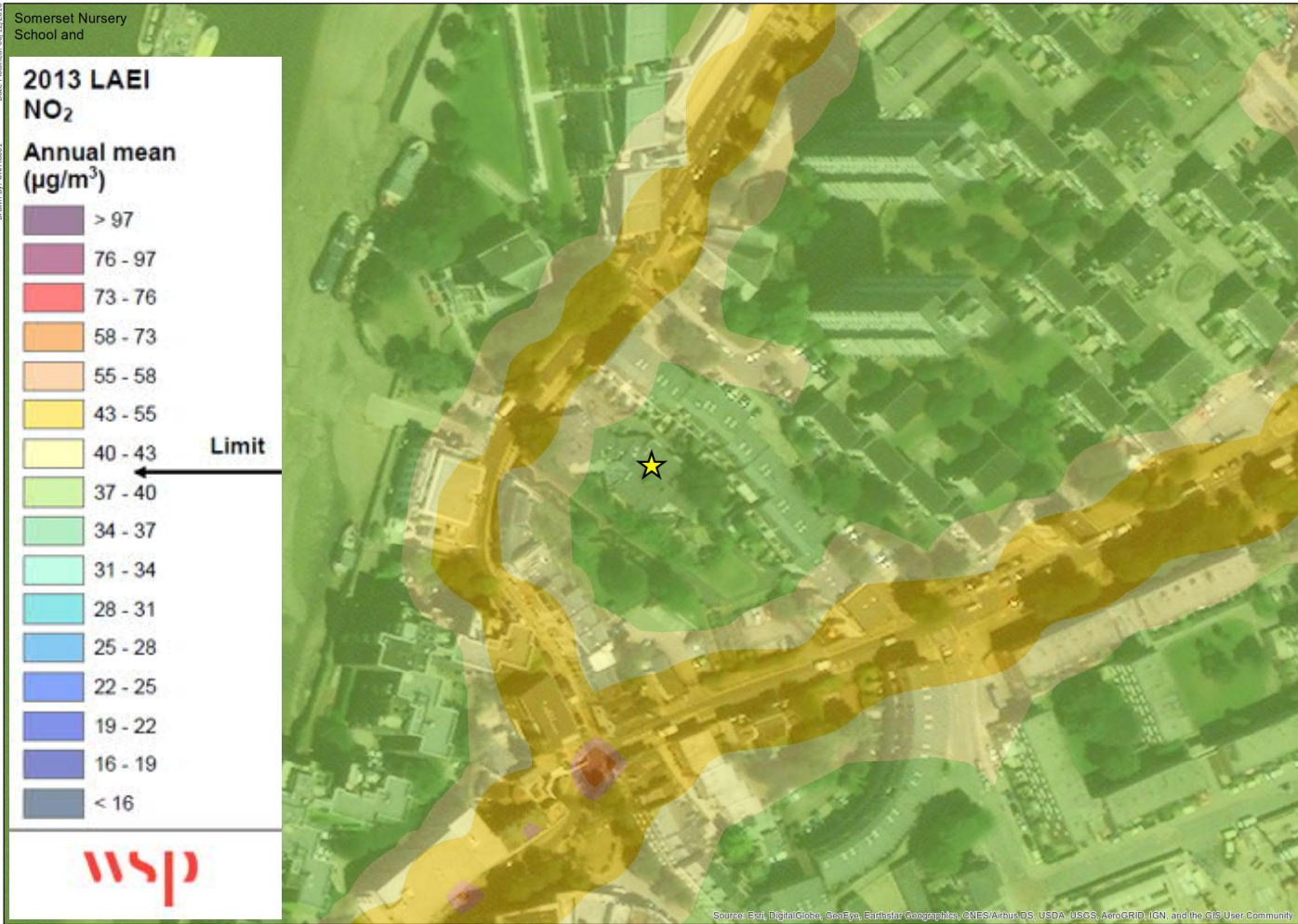
4.1.23. Nearly 50% of NOx emissions in London are from road transport. Vehicle emissions data for the LAEI modelled road links within 200m of the nursery, split by source, have been analysed to identify the key sources contributing to NO_2 in the vicinity of the nursery.

4.1.24. The pie chart below shows that while buses make up only 2% of vehicle movements, they contribute 12% of the transport related NO_x emissions locally. Similarly, HGVs only account for 2.5% of the total traffic but contribute 21% of emissions. However, it should be noted that with TfL's commitment to upgrading the whole bus fleet to the cleanest Euro VI vehicles as a minimum, by October 2020, that the emissions contributed by buses will be expected to fall significantly.

Figure 7 – Average Road Transport – by Vehicle Type (within 200m of nursery)
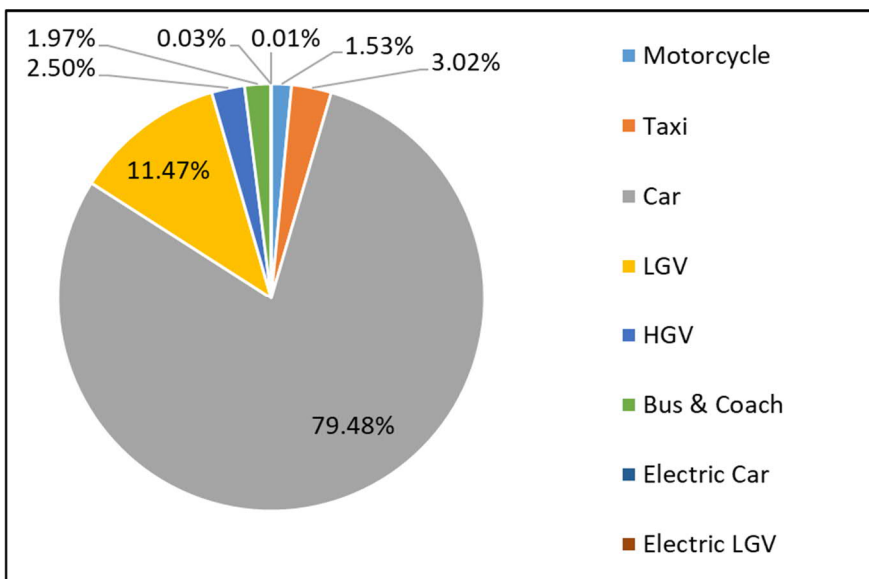
Figure 8 – Average Road Transport NO_x Emissions by Vehicle Type (within 200m of nursery)
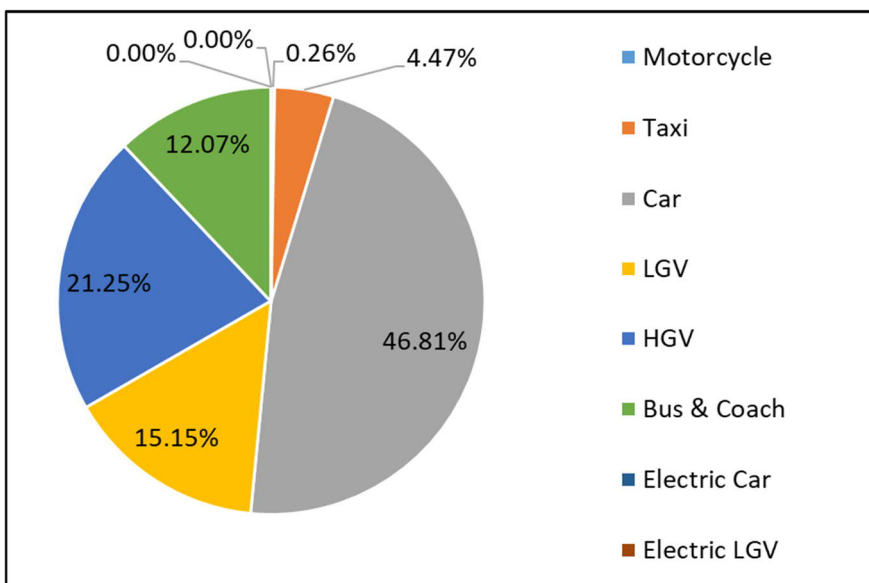
4.1.25. The pie charts below illustrate that PM_{10} and $PM_{2.5}$, like NOx, are emitted in higher levels by large vehicles such as buses, HGVs and LGVs, though not to the same extent. Buses make 2% of vehicle movements, and contribute 13% of the transport related PM_{10} emissions locally, and 6% of $PM_{2.5}$.

Figure 9 – Average Road Transport PM$_{10}$ Emissions by Vehicle Type (within 200m of nursery)
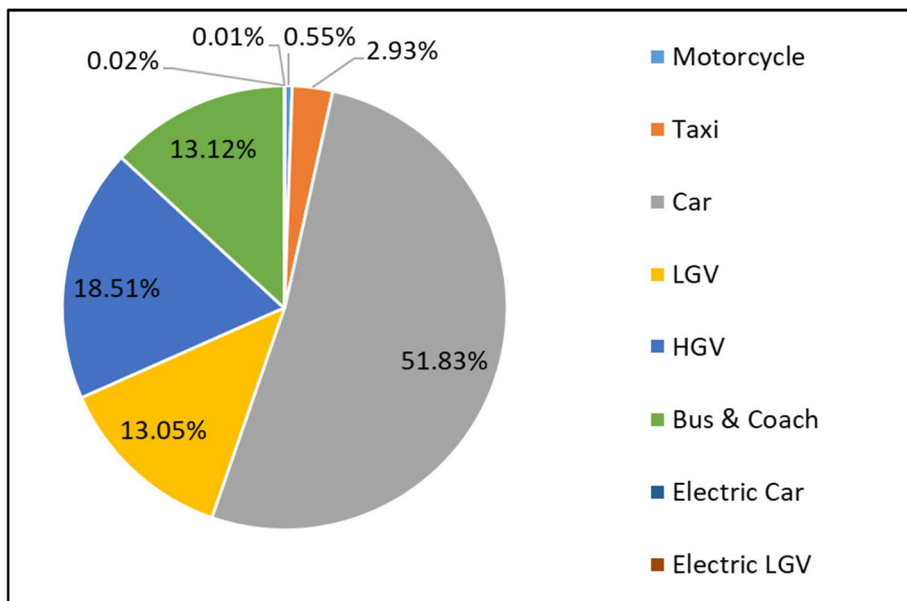
Figure 10 – Average Road Transport PM$_{2.5}$ Emissions by Vehicle Type (within 200m of nursery)
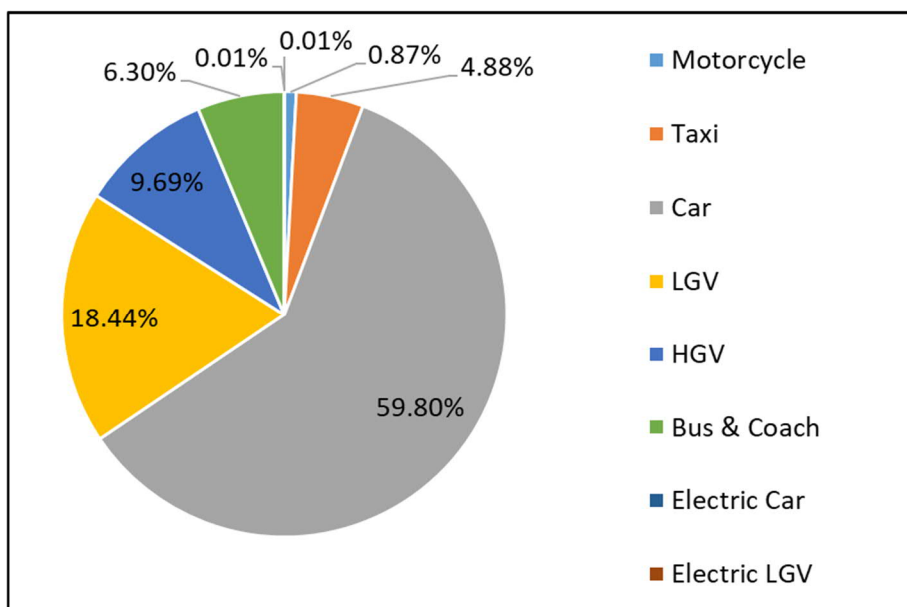
4.1.26.   Figures 11-13 show the 2013 LAEI baseline annual mean NO$_x$, PM$_{10}$ and PM$_{2.5}$ concentrations in within 2km of Somerset Nursery School and Children's Centre. The contours (changes in colours) show how the pollution gradient changes, with distance, away from the heavily trafficked roads and other key sources.

4.1.27.   PM$_{10}$ and PM$_{2.5}$ sources are much more universal and dispersed than NO$_2$ sources. A proportion of PM$_{2.5}$ and PM$_{10}$ is imported via weather events from regions outside of London, with other contributions coming from combustion processes, cleaning street sweeping/ dust re-entrainment, construction dust, etc. Therefore, concentration profiles of PM$_{10}$ (Figure 11) and PM$_{2.5}$ (Figure 12) appear less defined than for NO$_2$.

Figure 11 – 2013 LAEI Baseline Annual Mean NO$_2$ Concentrations within 2km of Somerset Nursery School and Children's Centre

Note: 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

Figure 12 - 2013 LAEI Baseline Annual Mean PM$_{10}$ Concentrations within 2km of Somerset Nursery School and Children's Centre

Figure 13 - 2013 LAEI Baseline Annual Mean PM$_{2.5}$ Concentrations within 2km of Somerset Nursery School and Children's Centre
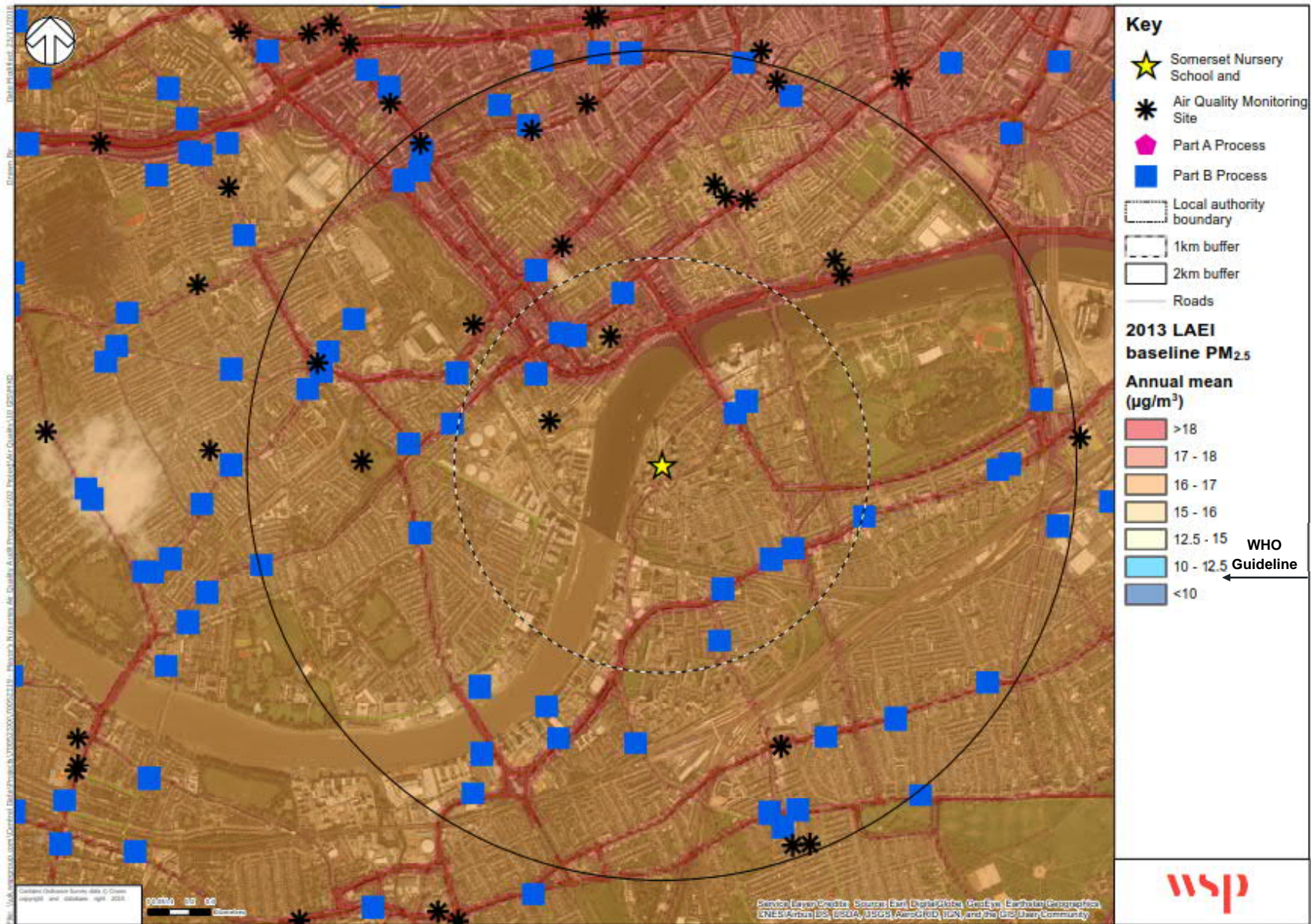
4.2. HIGHWAYS – KEY OBSERVATIONS

4.2.1. The nursery has two pedestrian access points. The first is on Battersea Church Road, while the second is from Sunbury Lane.

4.2.2. **Battersea Church Road is a relatively congested, mainly with cars and some vans**, and is used as a rat-run between Westbridge Road and Battersea Bridge Road. Traffic queues from the Battersea Church Road / Westbridge Road junction, which results in **idling vehicles** at the northern perimeter of the nursery. These idling vehicles particularly impact on the adjacent 2-year-old outdoor area and the children's centre within the nursery site.

4.2.3. Battersea Church Road is a **bus route** with 8 buses an hour in operation, contributing disproportionately to local air pollution.

4.2.4. To the north of the nursery and Battersea Church Road is the River Thames which has a path along its southern bank. This could be a relatively low-pollution route for parents and children to access the school. However, there **are limited safe crossing opportunities** across Battersea Church Road. It is noted that there is a right-turn pocket adjacent to the bus stop that could be converted into a pedestrian refuge to facilitate pedestrian crossings.

4.2.5. Considering its relatively central location within London, the nursery has **limited public transport** accessibility. As mentioned, previously there is one bus route along Battersea Church Road. This route only travels in one-direction (westbound). The eastbound service travels along Westbridge Road (to the south of the nursery). The closest rail or underground station is Clapham Junction (which is about a 20-minute walk south of the nursery).

4.2.6. The access point along Battersea Church Road can be used by pedestrians and has a parking area at the entrance. Access is controlled through a lockable gate. As a result, the **nursery school's parking area** is not generally accessible to staff and parents, and is reserved for contractors (when required). Staff, parents and day-to-day deliveries are not normally provided access to this parking area. When not in use as a car park, this area forms part of the nursery's forecourt.

4.2.7. Due to the relatively large number of vehicles along Battersea Church Road, narrow carriageway and keep clear lines along the nursery frontage – parents do not stop to drop off and collect their children on this street. Staff and parents parking, drop off and pick up, and deliveries instead use Sunbury Lane.

4.2.8. Sunbury Lane has filtered permeability installed, which restricts through traffic, but retains access for pedestrians and cyclists. As a result, it has limited traffic movement, and is used primarily for on-street parking, which is restricted to permit holders or pay and display (Mon-Sat, 9am-5pm, maximum stay 4 hours).

4.2.9. The pedestrian access to the nursery is provided as a cut-through of the existing flats between the road and the nursery. Based on observations, most children and parents access the nursery via Sunbury Lane, whether by sustainable modes or car.

4.2.10. Whilst most parents and children walk or scoot to the school, many parents were observed dropping off children by car. The majority parked on a private driveway on Sunbury Lane, adjacent to the cut-through between the existing flats. The result is that parents park on private land, blocking residents from accessing their properties.

4.2.11. This **anti-social parking** issue amongst nursery staff, with complaints received previously from residents. The nursery is aware of the issue and periodically includes this within their notices and patrols of the driveway. The headteacher is noted to discuss the issue with offending parents.

4.2.12. In addition, several parents were noted to park in the permit parking / pay and display bays along Sunbury Lane without a permit or paying for parking.

4.2.13. Battersea Church Road is relatively narrow, and flanked by tall buildings in sections, which can result in a **street canyon effect**, whereby emissions are trapped at street level, though the streets proximity to the river and the number of breaks in the building line will mitigate this affect to an extent.

4.2.14. While the northern frontage of the nursery is subject to air emissions from road-based sources, it is recognised that the travel to school by car activity is only a small contributor to overall poor air quality around the school, and that much of air pollution in this location will be associated with wider background emissions

4.2.15. With the exception of the Battersea Church Road frontage, the nursery backs onto private gardens and multi-storey flats, which provides protection from road-based emissions.

Summary – Key Issues

- **Battersea Church Road is a relatively congested, mainly with cars and some vans**. High levels of congestion and queuing traffic stretching around the school on unsuitable local roads, which results in engine idling at the northern perimeter of the nursery. This particularly affects the 2-year-old outdoor area and the children's centre.
- **Limited safe crossing opportunities** across Battersea Church Road for parents and children – limits the opportunity to access the school via the path along the River Thames.
- **Limited public transport accessibility** with only one bus route running along Battersea Church Road (westbound only). The nearest station is Clapham Junction which is about a 20-minute walk to the south.
- **Anti-social parking by parents** – some parents parking on the private driveway to drop and pick up children, resulting in complaints from residents. Other parents parking in the permit parking / pay and display bays along Sunbury Lane without a permit or paying for parking.

Nursery access on Battersea Church Road
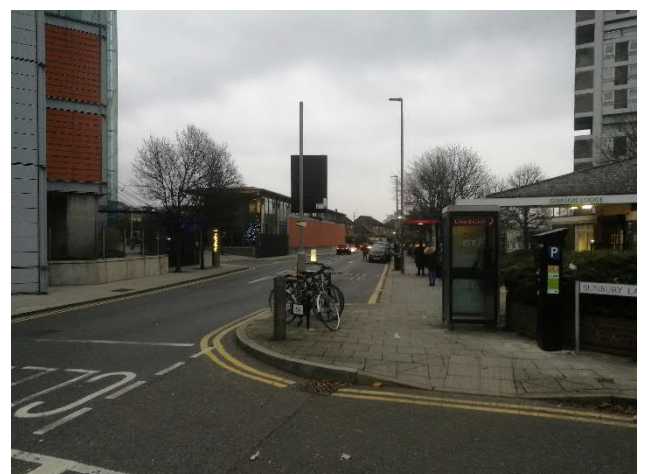
Bus stop adjacent to Sunbury Lane

Parents parking on private driveway including on footway

Parking along Sunbury Lane

(permit holders or pay and display: Mon-Sat, 9am-5pm, maximum stay 4 hours)

Idling traffic backed up from junction of Westbridge Road and Battersea Church Road

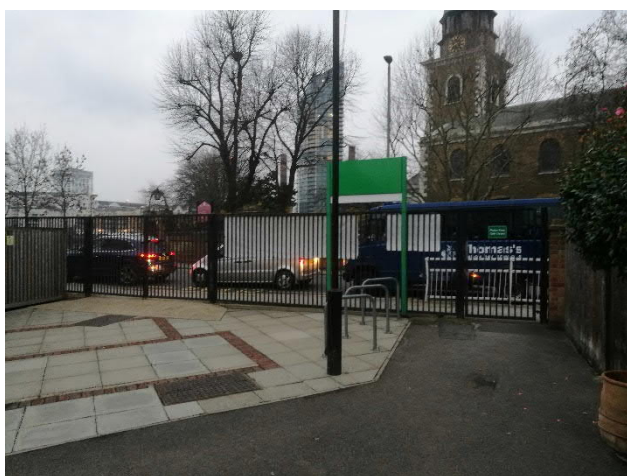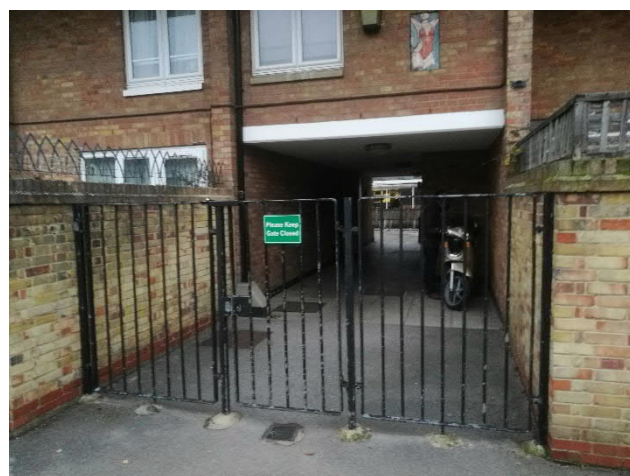**No safe crossing across Battersea Church Road**

Access point on Battersea Church Road

Access point from Sunbury Lane

4.3. NURSERY GROUNDS / BUILDING - KEY OBSERVATIONS

4.3.1.   The nursery school and children's centre is a single-storey building, estimated to be of late twentieth century construction. It is set out in one long building, orientated north to south from Battersea Church Road. The children's centre, 2-year-old classroom, offices and staff room are located in the northern part of the building. The middle section of the building contains the kitchen, while the southern section contains the main classroom.

4.3.2.   The 2-year-old outdoor area and children's centre **back onto the busy Battersea Church Road**, and so are the most exposed area of the site to primary source of local air pollution. The 2-year-old classroom is located further away from the road, but leads directly onto the playground. The playground is screened from Battersea Church Road by a brick wall, which also has some trees and limited greenery to increase screening from road-based emissions.

4.3.3.   The children's centre, like most of the nursery, is **reliant on natural ventilation** by opening windows and doors. The children's centre is well used, and has a range of activities on every day of the week.

4.3.4.   The main nursery classroom area is located to the south of the building and is set back away from Battersea Church Road. It is essentially one large space that is broken up into several inter-connected smaller areas.

4.3.5.   The main classroom leads directly onto the main playground which forms an extension of the classroom. Children can freely move between the indoor and outdoor areas. The children typically free-flow between the classroom and the playground throughout the day, with exception of lunch break and an initial settling in period.

4.3.6.   The main outdoor area is screened from a private garden (for local residents) via a relatively sturdy bamboo fence. There is additional planting on the private garden-side to increase privacy. The playground is a relatively large space, between the private garden and the nursery building. As can be seen from the photos, it has trees dotted throughout, with vines and low shrubs.

4.3.7.   The **main nursery's outdoor area** is to the west and rear of the site, set further back from Battersea Church Road. It is surrounded by walls, and some shrubs / trees / green screening, as can be seen in the photos of the playground. Further screening from air-based emissions is provided by the surrounding flats and private gardens.

4.3.8.   The **kitchen** is in the middle of the building, and is accessed through a corridor which connects the children's centre / 2-year-old area to the main classroom. It has extract systems which went out through large ducts away from the building. No noticeable odour was present, suggesting that the extraction systems work well.

4.3.9.   The nursery has two **boiler rooms** with a single boiler in each, which are accessed from the outdoor area. A smaller boiler is for the children's centre, while a larger boiler is used for the nursery. Both are relatively new (with one being replaced in October 2018) and were considered to be in excellent working order. The larger boiler flue exits high on the nursery roof well away from the playground, while the flue for the smaller boiler is noted to exit from the side of the building, **directly into the 2-year-old playground**.

4.3.10. The school has several **air conditioning units**, but is otherwise reliant on natural ventilation. The building in general, has average single-storey height ceilings, and given the age of the building is likely to be **reasonably well insulated**. Staff noted that parts of the building can experience higher

temperatures during warmer weather, requiring windows/doors to be opened and so result in greater exposure.

4.3.11. **Scooter and buggy parking** appeared only lightly used. The school advised more children scoot in the summer months, and that the buggy parking can fill up when parents attend activities at the children's centre.

4.3.12. School **deliveries** take place via Sunbury Lane; with a maximum of two deliveries a day on average. This includes a daily milk delivery, post three times a week, kitchen deliveries every two days as well as ad hoc deliveries for staff.

4.3.13. As would be expected in a nursery, **paints and glue sticks** were used widely by the children throughout the classrooms, and consequently the odour was noticeable around these areas. When not in use they are placed in an external store cupboard, away from the classroom and children.

4.3.14. There was not a strong odour of **cleaning products** in the building, and when not in use they are stored in the Caretakers Store adjacent to the kitchen, away from the classrooms behind closed doors, which is not accessible to the children.

4.3.15. The classroom **floors** are predominantly comprised of carpet, with some areas of lino or vinyl. The rooms are **furnished** with items made from a variety of materials including wood (some of which are likely to be MDF), plastic, metal, wicker, as well as some soft furnishings.

4.3.16. The nursery building contained only a limited number of **green plants**.

Summary – Key Issues

- **2-year-old playground and children's centre exposed to heavy traffic pollution** – these areas are closest to Battersea Church Road which is the main source of local emissions
- **The classrooms are all reliant on natural ventilation** – results in higher temperature during warmer weather, requiring windows/doors to be opened and so greater exposure.
- **Smaller boiler flue extracts directly onto 2-year-old playground** – exposes children to increased emissions due to the flue being at wall height
- **Limited scooter and buggy parking to encourage children to scoot to school** – the buggy parking is noted to fill up during the summer months, when up to 20 buggies parked at the entrance
- **Limited green plants in the classroom and children's centre**

Existing scooter and buggy parking

2 Year outdoor area

Nursery outdoor area

Children's centre

Main classroom

Typical furniture and windows in main classroom

4.4. KEY OBSERVATIONS – SUMMARY OF ISSUES

Figure 14 - Summary of Potential Issues Map

Limited public transport accessibility:
Only one bus route running along Battersea Church Road (westbound only). The nearest station is Clapham Junction which is about a 20-minute walk to the south.

Limited crossing opportunities for pedestrians:
Limits the opportunity to access the school via the path along the River Thames

Anti-social parking:
Some parents were dropping children by car and noted to park in the CPZ without permits

Heavy traffic flows due to rat-running on local roads:
Rat run along Battersea Church Road, resulting in queuing traffic outside the children's centre

Conflicts with local residents:
Some parents were dropping children by car, parking illegally on the private driveway

Nursery playground and outdoor spaces exposed to heavy traffic pollution:
In particular the 2 year old outdoor area

Limited scooter and buggy parking:
Limited scooter and buggy parking to encourage children to scoot to school

Classrooms exposed and reliant on natural ventilation:
The children's centre which is adjacent to the road, in the most polluted area of the site and reliant on natural ventilation.
The classrooms are all reliant on natural ventilation. Higher temperatures during warmer weather, requiring windows/doors to be opened and so greater exposure

Smaller flue extracts directly onto 2-year-old playground
exposes children to increased emissions due to the flue being at wall height

Limited green plants in the classroom and children's centre

Private driveway

Sunbury Lane

Battersea Church Road

Vehicle access

Children's Centre

2 year old area & staff room

2yo play area

Nursery School 3 year olds+

Nursery school outdoor area

Outdoor green space (for local residents)

Sunbury Lane

Key – Issues

School Grounds

Highways

School Building

Behavioural

Legend:
- Nursery Boundary
- 20 Speed Limit
- Pedestrian Crossing
- Pedestrian Access
- School Clearway
- Traffic Signal

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5. RECOMMENDATIONS

5.1. DEVELOPING THE RECOMMENDATIONS

5.1.1.   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. 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 nurseries.

5.1.2.   These recommendations are drawn from a comprehensive Air Quality Audit **Toolkit of Measures**, researched and developed as part of the Mayor's Primary School Air Quality Audit Programme, and updated as part of this programme (see Appendix E for further details).

5.1.3.   The toolkit has been compiled from a review of best practice approaches and new technologies, including both well established and simple measures, and more innovative or harder hitting measures. The measures include both physical measures and softer behavioural measures.

5.1.4.   The characteristics of the local area, nursery site and building have then been accounted for in 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 have also sought to be cognisant of any relevant existing plans for the local and wider area around the nursery (see Section 3.2).

5.1.5.   A key facet of this approach, and the palette of measures from which measures were identified, is that they represent a holistic 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 nursery. As such whilst a number of measures are less directly related to air quality, they were felt to offer the potential for contribute indirectly, for example through creating a better and safer environment for travelling by sustainable modes.

5.1.6.   Table 4 on the following page sets out the list of recommendations. For the purposes of this assessment they have been categorised as proposals associated with:

- **Highways** – where recommendations would predominantly be delivered by either the borough council or TfL, who manage the highways.
- **Nursery grounds** – where the nursery, often supported by the borough council, would typically deliver the types of measures recommended.
- **Nursery building** – as with the nursery grounds, the building measures would primarily be delivered by the nursery and borough council.
- **Behavioural** – many of the behavioural measures can be delivered at minimal cost by the nursery, sometimes with the support of the borough council or TfL.
- **Wider measures** – these are larger schemes or policy changes, which would need to be delivered by TfL, the borough council or the UK Government.

5.1.7. In order to enable comparison of each measure, and to assist the nursery, borough and other stakeholders, in determining which measures to prioritise, each has been assessed against a series of key criteria:

- **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 Early Years 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 have strong support from key stakeholders

5.1.8. These are high level comparative analyses intended to offer a means of considering the recommendations against one another in relative terms.

5.1.9. 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.

5.1.10. The implementation of the measures will be dependent on securing funding to enable delivery over time (see section 5.8), as well as undertaking feasibility assessments and scheme prioritisation.

Table 4 – Recommended measures for consideration

Measure	Description	Purpose	Potential Air Quality Improvement			Wider Benefits	Cost			Deliverability			Stakeholder Support		
			Low	Medium	High		Low	Medium	High	Quick Win	Medium Term	Long Term	Low	Medium	High
Highway (Key Stakeholder: Borough)															
1 Discourage rat running and speed with traffic calming	The volume and speed of the vehicles travelling along Battersea Church Road results in localised congestion engine idling and emissions, affecting the children's centre and 2-year-old outdoor play area. Measures should be investigated to discourage rat-running along Battersea Church Road. The introduction of traffic calming and greater enforcement of existing speed limits could serve to discourage rat-running and change the character the road to a more residential/local road, fostering a safer environment for pedestrians, and encourage more travel by sustainable modes. This could take the form of build outs to create single lane priority narrowing's.	Reduce sources and exposure		X		▪ Road safety		X		X				X	
2 Promote cleaner routes to school	Encourage children to avoid busy routes, in particular, Battersea Church Road and the B305 Westbridge Road. In conjunction with awareness raising.	Reduce exposure	X				X			X					X
3 Healthy Streets approach, sustainable transport and roadspace reallocation from vehicular traffic	Continue to follow the Healthy Streets approach, promote sustainable transport and roadspace reallocation from vehicular traffic, and take a proactive role in endorsing the approach and supporting these initiatives, and equally hold TfL, London Councils and the GLA to account in implementing these principles.	Reduce sources and exposure			X	▪ Promotion of sustainable travel			X			X		X	
4 Improve visibility of the nursery and raise awareness of anti-idling	Increase prominence of nursery to encourage more responsible driving and parking amongst passing traffic. This could be achieved using banners, murals or displays, or themed bollards outside the nursery. This could be combined with wider awareness raising, including anti-idling signage, in addition to the existing banner, to further promote anti-idling.	Reduce exposure	X			▪ Road safety	X			X				X	

|	Measure	Description	Purpose	Potential Air Quality Improvement			Wider Benefits	Cost			Deliverability			Stakeholder Support		
				Low	Medium	High		Low	Medium	High	Quick Win	Medium Term	Long Term	Low	Medium	High
5	Additional parking charges for more polluting vehicles	Consider introducing surcharges on top of existing parking charges for more polluting vehicles. A trial in Westminster found that the number of dirtier diesel vehicles using the parking bays dropped by 12%. The revenue raised can be used to contribute towards measures to improve air quality.	Reduce sources and exposure			X			X			X		X		
Highway (Key Stakeholder: TfL)																
6	Low Emission Buses	Since 2018, all new double deck buses are hybrid or zero emission. The Mayor has also launched an £85m programme to upgrade around 5,000 buses so that the entire fleet meets the Euro VI emissions standard in 2020. Around 75 per cent of all TfL buses – including all buses operating in the ULEZ – now meet or exceed the strict ULEZ emission standards. By October 2020 every TfL bus in London – over 9,000 buses - will meet or exceed the ULEZ standards. Twelve new low Emission Bus Zones are being introduced in areas where Londoners are exposed to some of the highest levels of nitrogen dioxide pollution. The Mayor has completed ten of these zones, reducing NOx emissions from buses by an average of 90 per cent along some of the capital's most polluted roads. The Mayor will complete delivery of all 12 routes ahead of schedule in 2019 rather than 2020	Reduce sources and exposure			X				X		X			X	
School Grounds (Key Stakeholder: School/ Borough)																
7	Green Infrastructure	Install green screening/climbers around the exposed northern perimeter of the school ground (adjacent to Battersea Church Road). A dense vegetation layer with a high leaf density can catch some pollutant and particulates and hang on to them until they can be washed away by rainfall.	Reduce exposure to emissions	X			▪ Visual amenity ▪ Security, privacy		X			X			X	
8	Scooter/ Cycle Parking	Increase scooter and cycle parking spaces to encourage sustainable / healthy travel	Promoting walking, scooting and	X			▪ Promotion of sustainable transport	X			X					X

	Measure	Description	Purpose	Potential Air Quality Improvement			Wider Benefits	Cost			Deliverability			Stakeholder Support		
				Low	Medium	High		Low	Medium	High	Quick Win	Medium Term	Long Term	Low	Medium	High
		behaviour, particularly near the main entrance.	cycling by providing improved local conditions	(green)			▪ Supports STARS objectives	(green)			(green)					(green)
School Building (Key Stakeholder: School/ Borough)																
9	Air Filtration Systems	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 do require ongoing maintenance and power consumption, but have demonstrated some encouraging initial scientific evidence of efficacy. They can also assist with virus elimination/ reduction. The findings of the Air Filtration System trials will be available to inform this decision in early 2020.	Reduce exposure to emissions	X			▪ Improved learning environments ▪ Child health and welfare			X	X				X	
10	Divert boiler flues away from playground	Divert boiler flues to the rooftop and away from the playground, to raise their exhaustion height further away from children playing. Flues and extraction equipment should ideally be exhausting above roof ridge height to aid quick dispersal. In some cases there can be complications with raising their exhaustion height further due to pressure drops, so specialist advice should be sought.	Reduce exposure to emissions	X				X			X				X	
11	Add indoor plants	Consider deploying additional air purifying plants. Whilst the research to date is inconclusive, and further testing is required, some studies have found certain house plants can remove CO_2, and that the growing substrate, and the microorganisms within, are involved in the removal of pollutants. A limitation is that tests often include a greater number of potted plants than would be feasible indoors to achieve measurable concentration reductions, so the density provided by green walls may be more suitable, and studies are now beginning to investigate green walls and, additionally, how the substrate may influence removal – as measured with VOCs. (University of Birmingham and the Royal	Reduce exposure to emissions	X			▪ Improved learning environments ▪ Visual amenity	X			X					X

	Measure	Description	Purpose	Potential Air Quality Improvement			Wider Benefits	Cost			Deliverability			Stakeholder Support		
				Low	Medium	High		Low	Medium	High	Quick Win	Medium Term	Long Term	Low	Medium	High
		Horticultural Society). Plants also have a number of wider health benefits, including promoting reductions in stress. https://www.cibsejournal.com/technical/plants -as-a-building-service/ provide		X				X			X					X
12	Switch to lower VOC cleaning products	Switch to lower VOC alternative cleaning products, such as unperfumed cleaning products.	Reduce sources and exposure	X				X			X				X	
Behavioural Measures *(Key Stakeholder: School/ Borough)*																
13	Staff Engagement	Awareness raising session amongst staff about the impacts / costs of heating classrooms and share best practice.	Reducing sources and exposure	X				X			X					X
14	Behaviour change	Prepare 'Welcome Packs' for new pupils / parents that includes the promotion of apps / sites such as 'www.walkit.com' to a) promote walking to / from school and b) promote the suitable walking routes to avoid air pollution hotspots.	Behavioural measures / reducing exposure to emissions.	X			▪ Awareness raising ▪ Secure community buy-in for measures	X			X				X	
15	Campaigns to discourage illegal parking	Engage with parents to discourage illegal parking on the private driveway and in the CPZ where pay & display or permits are required. This could include information signage, fines and reminders in newsletters.	Reducing sources and exposure	X			▪ Awareness raising ▪ Supports STARS and HSL objectives	X			X				X	
16	Sign up to the STARS programme	Sign up the STARS programme which would entail achieving a range of measures promoting active travel and reduced emissions, also signposting additional initiatives and avenues of support. The framework also helps document and track progress, and implement recommendations.	Behavioural measures / reducing exposure to emissions.	X			▪ Awareness raising ▪ Secure community buy-in for measures	X			X	X				X
17	Join Healthy Early Years London	This will entail reviewing its practice in promoting health & wellbeing and evidence achieving the planned outcomes.	Behavioural measures / reducing exposure to emissions.	X				X			X					X
Wider Measures *(Key Stakeholder: Borough/ TfL/ GLA/ Central Government)*																

Measure		Description	Purpose	Potential Air Quality Improvement			Wider Benefits	Cost			Deliverability			Stakeholder Support		
				Low	Medium	High		Low	Medium	High	Quick Win	Medium Term	Long Term	Low	Medium	High
18	Targeted scrappage scheme for polluting vehicles being driven in London	Ensure parents and staff are aware of the low income scrappage scheme being introduced by the Mayor and TfL, so that those that are eligible apply to the scheme. Encourage central Government to at a minimum match-fund the Mayor's scrappage commitments, to help enable even more Londoners to switch from polluting vehicles to ultra-low emission vehicles and more sustainable forms of transport.	Reduce sources and exposure			X				X			X	X		

5.2. KEY RECOMMENDATIONS

Figure 15 – Summary Recommendations Map
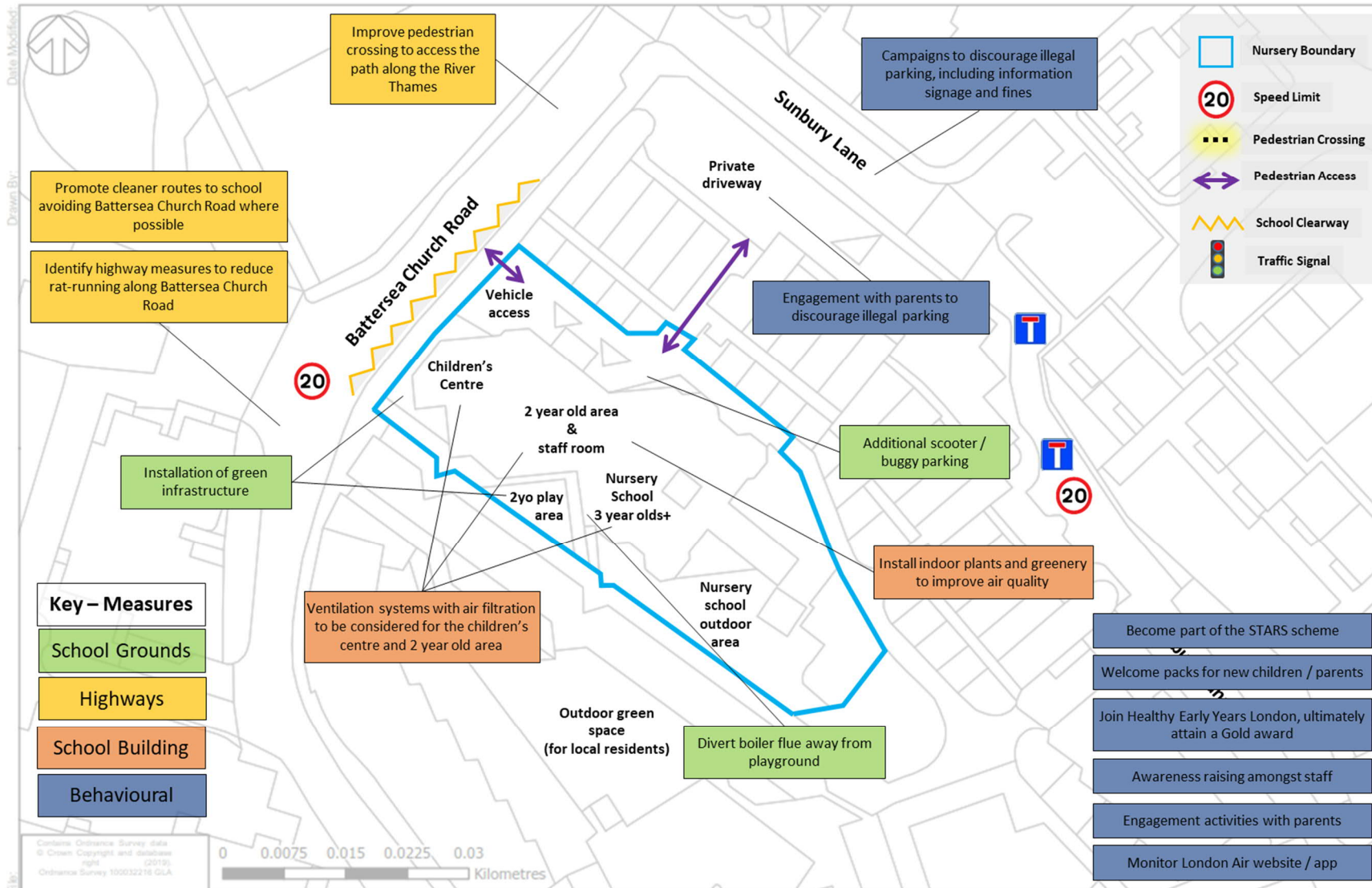
5.3. PRIORITISED MEASURES FOR THE NURSERY

5.3.1. To help prioritise what measures should be progressed for the nursery, borough officers and representatives of the nursery were asked:

'*Based on the toolkit of measures and the findings of the observations and initial analysis, what are the measures you would prioritise for the nursery?'*

5.3.2. Some of the more key measures were considered to be (in no particular order):

- **Air filtration systems** - The children's centre which is most exposed to traffic along Battersea Church Road should be considered for air filtration systems. In addition, it is noted that the nursery in general is reliant on the windows in the warmer months for ventilation. Air filtration 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. The findings of the Air Filtration System trials will be available to inform this decision in early 2020.

- **Green Infrastructure** - It was agreed that one of the key measures that should be progressed is the implementation of a green barrier to better protect the children's centre and the 2-year-old outdoor area most affected by idling traffic along Battersea Church Road. Kings College London have recently assessed the efficacy of green screens in preventing vehicle emissions from nearby roads reaching school grounds, through the installation of an ivy screen at nearby school. In this instance the screen was found to be an effective pollution barrier, once the ivy had started growing and a significant impact could be seen once the screen had matured. It led to a decrease in the pollution concentrations on the playground side by 24% for NO_2 and 38% for PM_{10}. It should be noted however that the same level of reduction would not necessarily be achieved in each instance, as the local conditions and designs are specific to each site.

- **Encourage parents to approach the nursery along less polluted routes -** This could include encouraging parents and children to avoid Battersea Church Road and Westbridge Road where possible. This can have a real impact on short-term exposure and is something that parents can be proactive with. The nursery could promote apps / websites such as 'www.walkit.com' to a) promote walking, and b) promote the suitable walking routes to avoid air pollution hotspots.

- **Discourage rat running with traffic calming -** Introduce traffic calming and greater enforcement of existing speed limits on Battersea Church Road, to discourage rat-running and change the character the road to a more residential / local road, fostering a safer environment for pedestrians, and encourage more travel by sustainable modes. This could take the form of build outs to create single lane priority narrowing and improved crossing opportunities to access the path along the River Thames – which could then be promoted as a cleaner route to school.

5.4. STARS ACCREDITATION SCHEME FOR NURSERIES

5.4.1. STARS is TfL's world leading school and nursery 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 above recommendations are recorded.

5.4.2. 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 the nursery.

5.4.3. Equally by embracing the STARS process, delivering sustainable travel activities, achieving modal shift targets and demonstrating effective community engagement, the nursery will have successfully delivered air quality improvements through reduced travel by cars. The framework of STARS enables the nursery and borough to document, track and share their continued progress, and embed and implement the recommendations throughout the nursery community.

5.4.4. Nurseries are encouraged to note any air quality related activity undertaken on their TfL STARS profile stars.tfl.gov.uk, and to help inspire other nurseries, they are required to tell their story for each activity they have delivered.

5.4.5. Somerset Nursery School and Children's Centre does not currently hold an accreditation. Our recommended measures for the nursery include a number or initiatives that would also count towards the achieving their STARS scheme accreditation, including promoting active travel and reduced emissions, and signposting additional initiatives and avenues of support. STARS activity cards are available for these measures, as well as wide range of other topics https://stars.tfl.gov.uk/Explore/Idea.

5.5. HEALTHY SCHOOLS LONDON

5.5.1. 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 nursery promotes active travel to and from nursery*", and provides a number of examples, including:

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

5.5.2. The nurseries must complete the following statements:

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

5.5.3. Our recommended measures for the nursery include a number or 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.

5.6. AIR QUALITY ALERTS

5.6.1. 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.

5.6.2. 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 nurseries.

5.6.3. Each nursery 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 for more information.

5.7. ENGAGEMENT

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

5.7.2. Following consultation with the nurseries and borough council as part of the audit process, bespoke awareness raising posters and web material were provided for each nursery – see Appendix D.

HEALTHY EARLY YEARS LONDON (HEYL)

5.7.3. 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.

5.7.4. 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
- 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

5.8. FUNDING OPPORTUNITIES

5.8.1.   A wide range of potential funding sources are available and should be considered to progress some of the measures outlined above, as set out in the figure below.

Figure 16 – Summary of Funding Opportunities
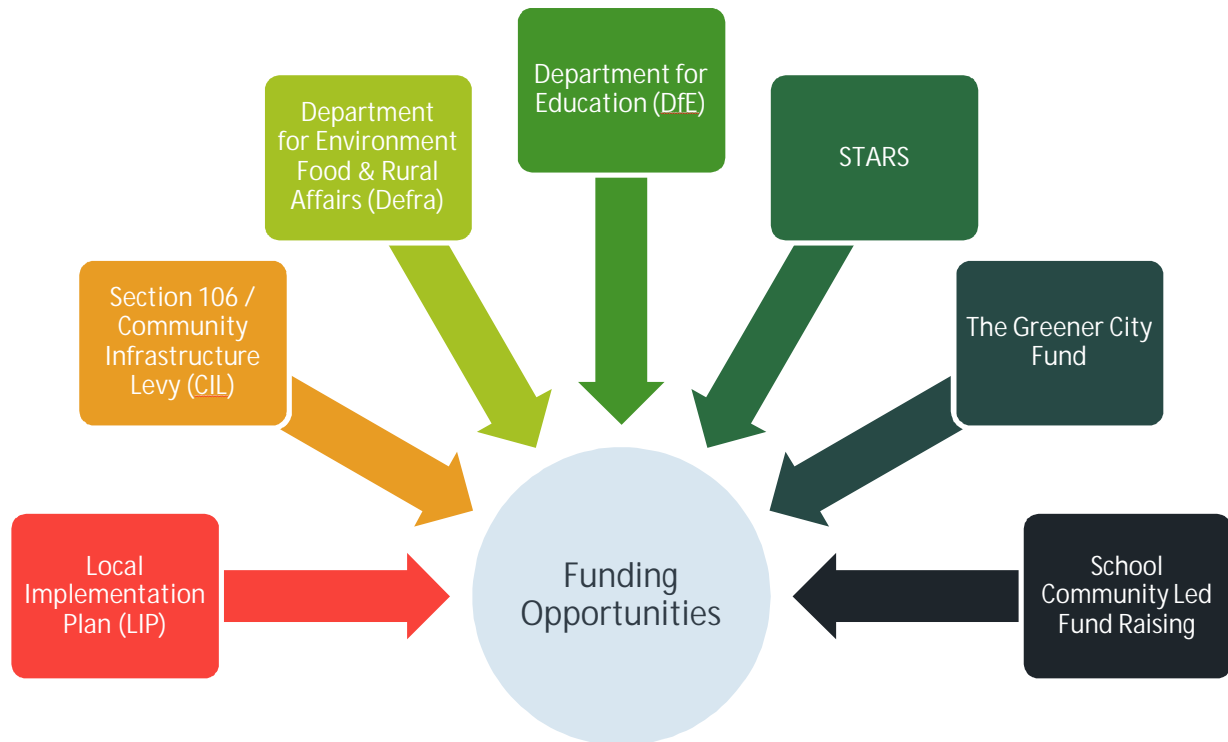
Local Implementation Plan (LIP)

5.8.2.   A primary source of funding is linked to the Local Implementation Plan (LIP) 3 that will provide spending from April 2019 until April 2020. The guidance on bidding specifically referenced the need to improve air quality at schools and nurseries.

Section 106 / Community Infrastructure Levy (CIL)

5.8.3.   Section 106 (S106) agreements and Community Infrastructure Levy (CIL) are potential sources of funding towards measures to address local air pollution. A Community Infrastructure Levy (CIL) is a planning charge introduced by the government via the Planning Act 2008.

TfL Liveable Neighbourhoods

5.8.4.   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 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.

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

5.8.5.   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.

Department for Education (DfE)

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

5.8.7.   Additionally, the Salix Energy Efficiency Loan Scheme provides funding for nurseries through DfE, to reduce energy costs through the installation of energy efficiency technologies.

Greener City Fund

5.8.8.   The Mayor's Greener City Fund (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. The Community Tree Planting Grant and Community Green Space grant schemes are open to applications from nurseries.

RE:FIT

5.8.9.   RE:FIT London is jointly funded by the GLA and the European Union European Regional Development Fund. The programme helps public sector organisations save carbon, energy and money by retrofitting buildings to make them more energy efficient. The RE:FIT London Programme Delivery Unit is an expert team which provides free end to end support to deliver projects.

TfL STARS Reward Scheme

5.8.10.   Whilst there is no specific funding attached to STARS, as gaining STARS accreditation helps boroughs reduce car travel, and increase cycling and walking, they often choose to link it to incentives – such as local grant funding through their LIP programmes.

5.8.11.   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)**
- **Health and Wellbeing Boards:**
- **Charitable Trusts**
- **Local business funding**
- **Consortium approach** – pooling funding with other boroughs and achieve economies of scale

Nursery Community Led Fund Raising Initiatives

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

Other Funding Sources

5.8.13.   There are several grant funding bodies who may be interested in funding recommendations particularly if a borough links up with a community organisation.

5.8.14. 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 Clinical Commissioning Groups (CCGs) base their funding priorities.

Other sources of funding for green infrastructure

5.8.15. Potential sources of funding for green infrastructure in nurseries include:

- The Tree Council's **Trees for Schools** programme
- The **Woodland Trust** offers free trees for schools and nurseries.
- The **Gregg's Foundation Environmental Grants** offer up to £2,000 for projects that improve the physical environment
- **Tesco Bags of Help** offer up to £4,000 to projects including school and nursery grounds
- **The Big Lottery Fund's Awards for All programme** offers up to £10,000 for projects that "improve the places and spaces that matter to communities", including nurseries
- **Trees for Cities** –match-fund the creation of Edible Playground teaching garden space, School Greening projects and Trees for Schools
- **Groundwork London** –support nurseries in designing and implementing green interventions.[11] Groundwork London's Our Space award[12] offers grants between £500 and £5,000.

5.8.16. See Appendix F for further information on potential funding sources.

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[11] https://www.groundwork.org.uk/Sites/london/pages/school-air-quality-greening

[12] https://www.groundwork.org.uk/Sites/london/pages/our-space-award

5.9. MONITORING

5.9.1.   An important outcome of the nursery 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.

5.9.2.   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 nurseries 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.

5.9.3.   In order to undertake these assessments and build on the baseline dataset generated as part of this audit, it will be essential to plan a programme of monitoring post implementation of any measures. This monitoring may include a wide range of metrics including surveys, traffic information, and air quality monitoring. The scope for monitoring should be proportionate to the extent of the problem and the scale of the investment.

5.9.4.   Where possible such monitoring should cover:

- Key pollutants (NO_x, PM_{10}, $PM_{2.5}$), and/or
- a range of other suitable metrics (i.e. travel to nursery mode shares, STARS and Healthy Schools accreditations, traffic counts (as a proxy for road transport emissions), nursery buildings and boiler conditions, surveys and behavioural responses of parents/staff).

6. NEXT STEPS

6.1.1.   In working with the nursery and borough officers to complete the air quality audit, we found there to be a passionate group of individuals, 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.

6.1.2.   The borough and nursery should investigate the scope for rapidly delivering key measures from the recommendations, to achieve a combination of quick win improvements for the nursery, whilst also thinking more holistically about how some of the medium to longer term recommendations can be progressed, to deliver more transformational change. By participating in this audit, the following steps have been completed:

- **Identified the sources of poor outdoor air quality** and exposure at nursery and within the surrounding catchment areas.
- **Identified the sources of poor indoor air quality** and potential exposure by children attending the nurseries, and established a baseline of indoor air quality.
- **Engaged the borough and other relevant stakeholders** to inform the context and feasibility of the proposed recommendations.
- **Identified, evaluated and developed recommended measures** within and around the nurseries' that will help a borough and nursery to reduce particulate matter, emissions and children's exposure to poor air quality.
- **Raised awareness within the nursery community** about the impacts of air pollution.

6.1.3.   In order to take forwards the recommendations identified within this report, the nursery and borough council will need to continue to work closely, building on the relationships already in place. A wide range of potential funding sources are identified within the report, and borough councils and nurseries are encouraged to apply for these where appropriate to maximise the potential for delivering the recommendations. The nursery has an important leadership role in ensuring that measures to reduce exposure and emissions are included in the nurseries strategic plans.

6.1.4.   STARS is an ongoing process, and the nursery 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. 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. The findings of the Air Filtration System trials currently underway will be made available as an update to the toolkit of measures.

6.1.5.   We also hope that the borough and nursery will come together as part of a wider School and Nursery Air Quality forum, to share their experiences with other nurseries and boroughs facing similar challenges. A wide range of guidance and useful literature is available to support further studies, schemes or initiatives for improving local air quality – see Appendix A.

Other formats and languages

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