

Measurement Guidance (Schools)

This document lays out guidance for taking pollution measurement around schools using diffusion tubes that measure Nitrogen Dioxide (NO₂).

By following these protocols you will create a data set that can not only engage your local community, but if you send us the data, can also contribute to our London wide data set. This allows us to make wider comparisons between schools and push for policy change at a local and GLA level.



Background of diffusion tube monitoring

- Diffusion tubes have been used since 2013 to complement official static monitoring networks (AURN).
- They should be placed in locations with good air flow over the course of two weeks to 1 month, and give an average reading over that period.
- They have $\pm 15\%$ accuracy, thus should be considered indicative measurements.

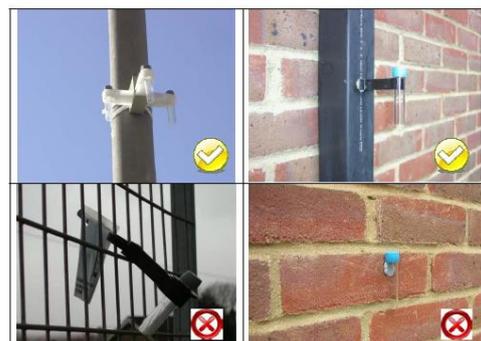


Figure 3-2 Examples of right and wrong ways to expose diffusion tubes

Why do diffusion tube monitoring?

The measurements are suitable for citizen science as they can indicate where pollution is highest, and where further study is needed. You could carry measurements out to:

- Compare routes to school and recommend quiet/less polluted routes to people;
- Demonstrate where traffic calming or anti-idling measures are needed;
- Examine the potential need for structural interventions, such as moving the school entrance, or placing green barriers around the playground;
- Compare pollution levels between term-time and holiday time.

Recommendations for placement around the school:

- Safety should be an important consideration when siting tubes at height or near to roads.
- The immediate area around the sampler location must be open, allowing free circulation of air around the tube.
- Ideally, tubes would be placed at breathing height, but in order to reduce theft of tubes, it is recommended that tubes are placed at a minimum height of 2m.
- Consider what you are trying to demonstrate first so you collect the right evidence;
- Ensure you collect comparative measurements (i.e. one tube on a quiet road, one on a busy);
- Consider pollutant sources, for example make sure you place them on the roadside of the pavement not by the shops.
- Consider where people are affected by pollution, and focus your data collection where the public is exposed.

Fixed locations to add to wider data set:

- At the entrance to the school
- At the school gate
- In the school playground

Note: 1 tube from each set should be placed by a nearby static monitoring station (from AURN or LAQN) so data can be annualised. *This means adjusted so the averages from your month/two week period are more comparable to annual means used in legal compliance. This is necessary due to variability in readings from external factors such as season or unusual atmospheric events.*

Other locations which are recommended (depending on the number of tubes):

- At the nearest crossing to the school
- At the bus stop or train station children use to get to school
- On the most commonly used side streets (ask children which roads they commonly walk)
- At traffic lights where children will stand waiting by busy roads
- In a local park where the children pass on their way to school

Other information useful to be recorded:

- Distance to nearest main road;
- Percent of perimeter bounded by roads;
- Percent of perimeter bounded by green space;
- Nature of surrounding roads;
- Extent of idling problem around the school perimeter;
- Traffic flow around the school perimeter.

These measurements **should be backed up through additional low-tech traffic and idling surveys**. These additional observations help to understand readings, and provide a stronger evidence base for intervention. Please see appendix for examples of how to carry out traffic and idling surveys with children.

Mapping routes to school

When mapping routes to school firstly a study to determine the most commonly used routes should be carried out. Following this:

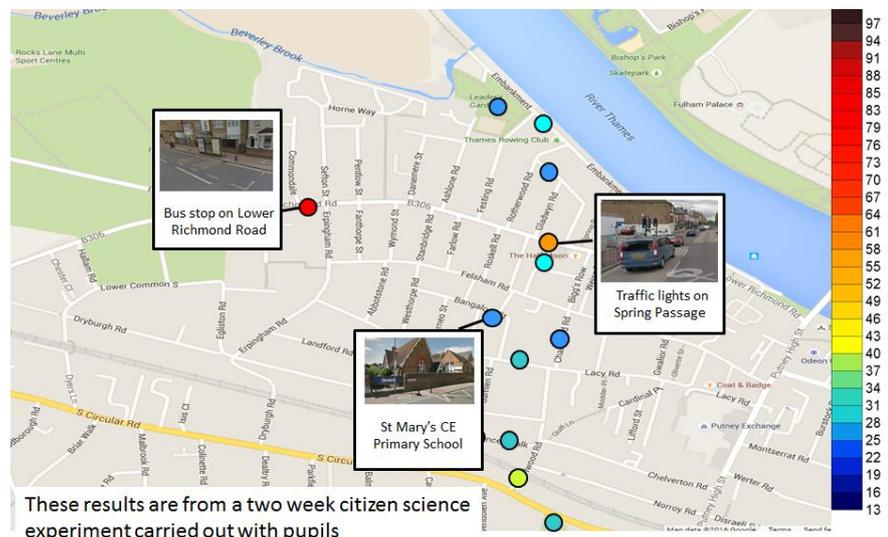
- All children case use wipes to monitor route;
- Some children or staff who use these routes can be selected through a random process to carry an instant monitor and GPS tracker (if available) to add to data set.

Mapping advice

Remember that the results are only indicative due to the nature of the accuracy of the diffusion tubes, and that they are only a snapshot of a 2-4 week period.

Therefore we recommend:

- Results to be presented without numbers in a map format using a scale similar to that of Kings College London (see map);
- Maps should be marked as results of a citizen science experiment, preferably indicating period and date of recording;
- Adding photos can help give context to the readings.



Appendix

Traffic Survey form

Idling Survey form

For more detailed information please refer to the guide that was commissioned by DEFRA for Local Authorities and laboratories 'Diffusion Tubes for Ambient NO₂ Monitoring: Practical Guidance':
https://laqm.defra.gov.uk/documents/0802141004_NO2_WG_PracticalGuidance_Issue1a.pdf