



Key considerations for future projects from the mobile mapping campaign

Monitoring plan

Sampling plan design

Clear objectives and local knowledge of air pollution concerns are key to tailoring sampling strategies. Plans need to be adaptive and flexible because, as experienced in Breathe London, real world traffic conditions impact repeat drive coverage. Optimising drive routes as well as journeys between sampling areas can improve sampling efficiency that could otherwise be impacted by transit time and local congestion.

It is also important for future project teams to understand the trade-off between spatial and temporal coverage with mobile platforms and that a single visit to a location provides little utility in analyses. As a minimum, Breathe London required at least five drive passes over monitoring sites of interest for hyperlocal mobile analysis. An understanding of sampling uncertainty as a function of number of visits and acceptable levels of sampling uncertainty for desired analyses can help guide the monitoring plan.

Vehicles, sensors and equipment

Vehicle space and power

These two factors influence what is possible in terms of monitoring instrumentation and need to be addressed in detail during planning. Instrument choices and operating modes were modified in Breathe London to reduce power draw, and custom installation was arranged to fit all the equipment safely and securely. The amount of power available on the mobile platform limited the data collection shifts and coverage so it is important to consider equipment with lower power requirements, smaller size, and less weight.

Parking

Finding a suitable, secure site for the cars to park is a key consideration. Due to the daily equipment checks and calibration needs, it was important that the parking location be easily accessible by the staff conducting those tasks. Additionally, there is value in parking the cars in proximity to reference monitoring sites to enable long-term evaluation of instrument performance, which can eliminate the need for intentional co-locations to be scheduled.

Driver training and manuals

While drivers need to conduct only basic operational procedures (e.g. turning on instruments), these can impact data collection and other parts of operations. Therefore, it is important to provide effective training and a user-friendly instruction manual for drivers, including basic troubleshooting procedures.

Instrumentation needs

Instruments utilised equipment like pumps more intensively on mobile platforms compared to laboratory settings and are therefore more prone to wear and tear. It is helpful to have backup items of specialist parts on hand. Instruments also need to be cooled for safe operation. Putting in place adequate cooling systems, both on the mobile platform and where the vehicles park overnight, is critical. We also recommended a thermal cut-off to power down instruments in the event of a cooling system failure as occurred during the Breathe London deployment.

Data quality assurance and quality control

Data logging

Logging data correctly is vital to the overall data quality and the ability of the dataset to be used for intended analyses. Critical considerations include synchronising instruments and GPS time stamps, testing instrument response time, automating alerts for data flags, uploading data daily and ensuring consistent instrument settings throughout the campaign.

Sampling systems

The configuration and design of sampling systems affects the results obtained. In future designs, the use of metallic tubing instead of plastic, avoiding sharp bends in the tubing, and utilising shorter tubing lengths can help overcome some of these effects. Characterization of uncertainty of the data, including PM_{2.5} sampling losses can be found in [Appendix 3](#).