

TEOM ADJUSTMENT FACTORS FOR A SUBURBAN ENVIRONMENT IN SYDNEY

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Summary

Previous studies have demonstrated that TEOM instruments using heated inlets may underestimate PM₁₀ levels in urban areas due to the loss of semi-volatile secondary aerosols and organic compounds. Whilst temperature-dependent or seasonal adjustment factors have been suggested as suitable procedures to bring closer agreement between traditional gravimetric methods such as high volume air samplers and other measurement techniques, considerable variability may still occur. Detailed compositional measurements are rarely available in Australasian situations that can provide a better approach for standardisation of TEOM or beta-attenuation techniques. Recent measurements at 2 sites in the M5 East tunnel air quality monitoring network (Sydney) allow reasonable seasonal factors to be defined but have much smaller adjustment factors than at a nearby EPA site. The implications for routine measurement campaigns and setting of project performance measures are discussed with reference to recent recommendations from Australian and European agencies.

Keywords: PM₁₀, TEOM, HVAS, tunnel ventilation

1. Introduction

The current project arose from negotiations between a major state government transport body and a local resident action group over the need for better determination of background air quality information in the debate of the need for or practicality of particulate filtration devices for the then-new M5 East tunnel project.

The M5 East Project consists of a 4 km twin tunnel taking traffic between Bexley North and Mascot in southern Sydney. The ventilation air from both eastbound and westbound traffic is transported 700 m in an underground ventilation shaft prior to being exhausted through a single 35 m high stack located on industrial land in the Turrella Valley. The stack is 200 m from nearby residents on a hill ridge to the north and north-west and close to light industry and adjoining public park and other residential lots to the south.

Of several contentious issues between the Road Traffic Authority (RTA) of New South Wales and a local residents action group (Residents Against Polluting Stacks (RAPS)), the potential underprediction of levels of particulates by automatic continuous monitoring (TEOM) equipment resulted in an agreed programme of action and scientific analysis. A four-site monitoring network (Figure 1) was established to produce real-time, high quality

measurements of CO, NO_x, TEOM PM₁₀ and meteorology together with regular high-volume air sampling (HVAS) of 24 hour average PM₁₀ at two (T1 and U1) of the four sites. The latter allowed an assessment of TEOM adjustment factors (HVAS/TEOM) but without any checking of potential losses from the HVAS itself. A Steering Committee was set up to advise and undertake data analysis as new information was being collected in order to provide site-specific adjustment procedures for use in ongoing identification of key pollution events and subsequent detailed processing of collated information.

Steering Committee recommendations were based on 12 months of information collected before the opening of the M5 East Tunnel and 11 months of information after its opening. HVAS sampling frequency was increased from 1 in 6 to 1 in 3 days for the last nine months of the program to increase data coverage for the important winter season. The adjustment factor recommendations have been drawn up in the absence of detailed information on the chemical composition of the filter samples and the size distribution of tunnel particulate emissions.

The objectives of the project were as follows:

- (a) Determine supportable TEOM adjustment factors from concurrent TEOM and HVAS measurements available at two of the four sites.