Guidance on Running the DMRB Screening Model

Introduction

The screening assessment for road traffic sources may be carried out using the screening model which has been prepared for the Design Manual for Roads and Bridges (DMRB) and has been published by the Highways Agency. A suitable version of the DMRB Screening Model (v1.03c) is available in Excel spreadsheet form and can be downloaded from the following link: Click here to download the DMRB model [1].

The DMRB screening model can be run to predict pollutant concentrations at receptor locations near to roads. It can be used to predict annual mean concentrations of nitrogen dioxide (NO_2) and PM_{10}, as well as oxides of nitrogen (NO_x), carbon monoxide, benzene and 1,3-butadiene. It also predicts the number of exceedences of 50 $\mu g/m^3$ as a 24-hour mean PM_{10} concentration. The model requires input data on annual average daily traffic flow (AADT), annual average speeds, the proportion of different vehicle types, the type of road, and the distance from the centre of the road to the receptor. Annex D, on page 64 of the DMRB guidance document gives instructions on how to run the model. Click here to download the DMRB guidance document [2].

The user is also required to input the background concentrations for the relevant year. Maps of background concentrations are available here: Click here to download background concentrations [3].

Relevant Locations

Authorities are reminded that for the review and assessment of the annual mean and 24-hour mean objective, predictions should be carried out at relevant roadside locations. Further guidance of which locations will be relevant is given in Box 1.4 of LAQM TG(09).

Verification

The DMRB Screening Model is not always 'conservative'. It is therefore important to verify the results from the DMRB model against local monitoring data. Further information about model verification is available in Annex 3 of LAQM TG(09).

[1] Or paste the following text into your internet address bar:
http://www.highways.gov.uk/business/documents/DMRB_Screening_Method_V1.03c__(12-07-07)_locked.zip

[2] Or paste the following text into your internet address bar:
http://www.standardsforhighways.co.uk/dmrb/vol11/section3/ha20707.pdf

[3] Or paste the following text into your internet address bar:
http://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

Conversion of NO_x to NO_2

The method to convert roadside NO_x to NO_2 within the DMRB model was based on measurements made between 1999 and 2001. Recent evidence shows that the proportion of primary NO_2 in vehicle exhaust has increased[4]. This means that the relationship between NO_x and NO_2 at the roadside has changed from that currently used in the DMRB model.

A new NO_x to NO_2 calculator, is available as a spreadsheet. Click here to download the NO_x to NO_2 calculator [5]. The calculator applies to all road types and can also be used to estimate roadside NO_x from roadside NO_2 measurements.

Use of the DMRB model should now be adapted to use the new calculator. The way to do this is described in Box 1.

Box 1: Instructions for taking account of recent changes in NO_2/NO_x ratios using the DMRB Screening Model (v1.03c).

Step 1: Run the DMRB model as usual, but enter a value of zero as the background for both NOx and NO_2.

Step 2: Take the NOx concentration predicted by the DMRB model and paste it into the "Road increment NOx" column of the NOx to NO_2 calculator (see paragraph 1.07) (the background is added at this stage).

Step 3: Run the NO_x to NO_2 calculator to calculate total-NO_2.

Street Canyons

1.01 DMRB model validation work carried out by the Highways Agency has indicated that the model may significantly underpredict concentrations of nitrogen dioxide alongside urban city-centre roads classified as 'street canyons'. In this context, a street canyon may be defined as a relatively narrow street with buildings on both sides, where the height of the buildings is generally greater than the width of the road. To avoid missing potential exceedences of the objective in such locations, the guidance given in Box 2 should be followed. Locations where this approach has been used should be clearly identified in the review and assessment report.

[4] For additional information on this topic, see: http://www.defra.gov.uk/environment/quality/air/airquality/publications/primaryno2-trends/documents/contents.pdf

[5] Or paste the following text into your internet address bar: http://laqm.defra.gov.uk/tools-monitoring-data/no-calculator.html

Short-term objective for NO_2

If the annual mean objectives are not exceeded, the authority may confidently assume that the short-term (1-hour) objectives will also be met. However, if this approach is used, then care must be taken to include relevant locations where the hourly objectives might apply (see Box 1.4 of LAQM TG(09)). If the annual mean nitrogen dioxide concentration is greater than 60 µg/m^3, then there is a risk that the 1-hour objective may also be exceeded.

Box 2: Instructions for taking account of street canyons using the DMRB Screening Model (v1.03c).

Step 1: Run the DMRB model and follow the instructions in Box 1. Record the road-NO_2 and **NOT** the total-NO_2 from the NOx to NO_2 calculator.

Step 2: Multiply the Road-NO_2 by a factor of 2.

Step 3: Add this value onto the background-NO_2 (that was entered into the NOx to NO_2 calculator) to give the "in-canyon total-NO_2".

Locations where this approach has been used should be clearly identified in the review and assessment report